XIV. *Notes on Australian Sawflies, especially the "Authors' Types" and other specimens in the British Museum of Natural History and the Hope Collections of the Oxford University Museum; with diagnostic Synopses of the Genera and Species, and photographs illustrating their structural characters.* By the Rev. Francis David Morice, M.A., F.Z.S.

[Read October 2nd, 1918.]

Plates XI–XV.

INTRODUCTORY.

This paper—the first in which I have ventured to treat of other than Palaearctic insects—is the result of an opportunity so exceptional that it seems almost a duty to make use of it. For a considerable time this year I have had continuous access in the British Museum of Natural History (*a*) to the entire "literature" of my subject, and (*b*) to very nearly the entire material on which that literature is based. The first Sawflies described from Australia were *Pterygophorus cinctus* and *interruptus* of Klug (1812), and the Types of these—presumably still at Berlin—were, of course, inaccessible to me. But almost all Australian genera or species since described were founded on specimens still preserved either in the Museum above mentioned (which shall hereinafter be denoted by the initials B.M.), or in the Hope Collections of the Oxford University Museum: and, through the kind assent of Professor Poulton to an application which I made to him, all specimens of Australian Sawflies in the latter Collections were temporarily entrusted to me for study and comparison with the material already before me in B.M.

This means that I have been able to examine at leisure and with every facility that could assist me at hand (*a*) the original author's Types (and sometimes also Co-types) of all forms described by Leach in 1817, Westwood in *Arcana Entomologica* (1841) and *Proc. Zool. Soc. Lond.* (1880), W. F. Kirby in his *British Museum List* and various later "Separata" (1881 to 1894), Gilbert Turner in *Proc. Linn.*

Soc. N. S. Wales, (1900), and S. A. Rohwer* in *Ent. News, Philadelphia* (1910). The B.M. Coll. contains also specimens of the remarkable genera *Philomastix* and *Phylacteophaga*, Froggatt (*Proc. Linn. Soc. N. S. Wales*, 1890 and 1899). These are not actually Types, but were all either determined by the author, or received from the same source as his Types.† Other interesting material which I have examined in B.M. includes many specimens of new or little-known Australian forms presented by Mr. Rowland Turner, and a *Pterygophorus* received early in the present year (1918) from Mr. Froggatt, which is evidently the *bifasciatus* of Brullé, and the only example of that remarkable species that has occurred since the original Type was described more than seventy years ago. In spite of Konow's *a priori* reasonings to the contrary, this species is most certainly a *Pterygophorus* and one of the most beautiful representatives of that beautiful genus.‡

Besides the above Australian material I have been able to examine in the B.M. and Oxford Collections many Types of exotic genera and species described by Westwood, F. Smith, W. F. Kirby, Cameron, etc., some of which, though not belonging to the Australian Fauna, seem allied to certain of its genera by the possession of several very abnormal and even paradoxical characters. Most of these insects are from South or Central America, a circumstance which will require consideration presently.

Apart from this great advantage of access to so many

* Mr. Rohwer kindly communicated to me, while these Notes were still in MS., a type-written copy of a Paper which has since appeared in *Ann. and Mag. Nat. Hist.* (Nov. 1918), containing descriptions of a new genus (*Zenarge*) and three new species. The Types of these are still in America, having been sent there from B.M. for determination by Mr. Rohwer in 1915. Duplicates, however, except in one or possibly (?) two cases, were retained in the Museum; and I had already dealt with these in my Tables, and given them names for which I now substitute those published by Mr. Rohwer.

† The Type-species of *Philomastix* (*glabra*) is figured and described by Westwood as "*Perga* (sic) *macleayi*," from two ♀ specimens at Oxford, both of which had lost their antennae before Westwood saw them. Otherwise he would, of course, have seen that the species could not be a *Perga*. This insect must in future, I suppose, be called *Philomastix macleayi*, Westw.

‡ The vessel conveying this precious specimen was torpedoed *en route*! But the insect, though literally drenched with a mixture of sea-water and naphthaline, is still perfectly recognisable, and for practical purposes little the worse for its adventures.

Types, the want of which access has greatly impaired the value of much recent work * on Australian forms, I have been singularly fortunate in being occupied on these investigations exactly when and where I could at once take counsel on any difficulty that might arise with a colleague who, of all men, was perhaps the best qualified to assist me. Mr. Rowland E. Turner, well known to all Hymenopterists as the author of many important memoirs on various groups of exotic Aculeates, had long devoted himself to voluntary work in arranging and augmenting the B.M. collections of Hymenoptera, and had lately received a formal appointment as an honorary member of the Museum Staff. He had previously resided for twenty years in North Queensland, and both there and in other parts of Australia (Swan River, Tasmania, the neighbourhood of Sydney, etc.) made large entomological collections, all which he has now presented to B.M. Though more specially interested in other groups, he had by no means neglected the Sawflies—in fact, several Australian species and at least two genera are known to me only through his captures. Being myself almost entirely ignorant of "exotic" insects, Hymenopterous or otherwise, and having only the vaguest ideas about the geography, physical features, climate, seasons, etc., etc., of the Australian "Realm," I naturally seized every opportunity of profiting by Mr. Turner's familiarity with all these subjects, and though I cannot regret that I have done so, I am conscience-stricken when I think how unscrupulously I have exploited his good nature.

I have also to thank an American colleague, Mr. S. A. Rohwer of Washington, for several very kind and encouraging letters, and for communicating to me unpublished notes of his own on some of the specimens which I have examined, as well as for copies of many of his Separata, especially his *Classification of the Suborder Chalastogastra* (Proc. Ent. Soc. Washington, 1911) and *Genotypes of the Sawflies and Woodwasps* (U.S. Dep. Agric., Technical Series No. 20, Part II. Washington 1911).

The Figures illustrating this paper are reproductions

* *E. g.* Konow's attempts to classify the known species of *Perga* and *Pterygophorus*. Having in most cases only old and inadequate diagnoses and figures to guide him, he naturally made many mistakes both in identifying species, and in deciding where to place them in his Tables.

of photographs (or in a very few cases of drawings) taken by myself from B.M. or Hope Coll. specimens, the parts figured having nearly always been prepared by Mr. A. Cant, F.E.S., in the Museum "Setting-room" by the kind permission of Dr. Gahan or Professor Poulton. I am greatly indebted to Mr. Cant for the invaluable assistance I have received from him in this matter, and am glad to think that his preparations will henceforth be a part (and, I think, a very useful part) of the Collections at Oxford and South Kensington. The photographs representing details of saws in the various species of *Perga* and *Xyloperga* were all taken at the same magnification, but this is not the case with the other figures. It will be noticed that in some of those representing antennae the two short basal joints are missing, but these joints are not particularly characteristic, and their omission is therefore of little consequence.

When these notes were commenced, and even after considerable progress had been made with them, they were intended merely as materials for a revision of the Genus *Perga*. But I afterwards resolved to adopt a suggestion made to me by Mr. Turner that they should include also some account of such other Australian Sawflies as were represented in the Collections to which I had access. The materials available for this part of my work were quite insufficient for the clearing up of many questions, which, as long as they remain unsettled, will render the production of anything that deserves to be called a "Monograph" impossible. Still, as I have seen all the Types of described species in some genera, and either Types or specimens which I have reason to believe are correctly named in all but one of the others, it seems worth while to indicate in tabular form the characters by which they seem most easily distinguishable in the specimens before me, even when I cannot be sure that these characters are of specific value.

Accordingly I have prepared dichotomic Tabulations or Synopses, first of the genera, and afterwards of the species in each genus of which more than a single species is known. Except in the cases of *Perga* and *Pterygophorus*, where some trouble has been taken to make the order in which the species are arranged correspond to my idea of their natural affinities, I have aimed in these Synopses at nothing more than to facilitate the naming by collectors of their specimens, and have employed indifferently whatever characters, whether of structure or merely of colora-

tion, seemed likely to be recognised most easily. It is quite possible that some of these characters are merely "individual," but of this there is always a chance when attempts are made to diagnose the characters of a species from a single specimen.

I will now give my Synopses of Genera and Species, and these will be followed by a few detached Notes, or "Excursuses," dealing with various questions which came up for consideration as my work proceeded. These are mere *Tentamina*, and probably very crude, for they often touch on subjects with which my acquaintance is very recent. But it has interested me to write them, and I hope no harm will be done by publishing them in their present shape.

SYNOPSIS OF THE GENERA.

(Genera marked thus † cannot be considered as indigenous.)

1. Antennae (see Figures in Plate XII, Figs. 1, 2) inserted close to the mandibles—lower down in the face than the lowest part of the eyes.* On each side of the head above (very near each eye) runs a series of little tubercles. Middle and hind tibiae denticulate along their hind-margins (Pl. XII, Fig. 18). The ♀ hypopygium appears as a sort of compressed longitudinal carina (in the middle of the 5th ventral segment). In the lateral view it is tooth-like (subtriangular); and beyond it is seen the exposed part of the paradoxically long and slender "terebra" or boring-organ (a modified ovipositor), resembling merely a fine hair, unless really highly magnified, when the apices of its paired "spicula" are seen to be armed with a very few minute teeth. (Its structure and attachments are very like those of the corresponding organ in a *Cynipid!*) Cf. Figs. 1, 2, 3 in Pl. XIII. In the ♂ the apex of the abdomen is simply convex above and below. The labial palpi are short, 3-jointed; the maxillary palpi much longer, 5-jointed. Each fore-leg has *one* calcar only; each posterior leg has *two*, but one of them is so short that it may easily be overlooked. Neuration of wings very incomplete. The antennae have 12 joints in the ♀, 11 in the ♂.

(Family Oryssidae.) Genus 1. *Ophrynopus*, Konow.

* Hartig and others say "below the clypeus," but what they take for the clypeus is in this case really a part of the abnormally developed "frons." The true clypeus is to be found lower down, between the insertions of the antennae and the mouth-parts, as in all Hymenoptera (I believe) without exception!

[The only Australian species is *O. sericatus*, Mocsary, described in *Term. Füz.* (Feb. 1900) from New South Wales. In the same year but some months later Mr. Gilbert Turner described the same species from Mackay, North Queensland, under the name *Oryssus queenslandensis*. The Type of *queenslandensis*, G. Turner (and many other specimens ♂ and ♀ from Kuranda, N. Queensland),* are in B.M., but not the Type of *sericatus*, Mocs. In this species the fore-wing of the ♀ is crossed by two conspicuous dark clouds, in the ♂ wing these are scarcely indicated (Pl. XI, Figs. 1 and 2).]

— Insertions of antennae *between* the eyes, never *below* them, and separated from the mouth-parts by a visible "clypeus." Top of head with no lateral rows of tubercles. Neuration of wings more or less complete, always with at least 3 closed cubital cells in each fore-wing. . . . . 2.

2. Front tibiae with only one apical spine or "calcar." Antennae many-jointed, long, slender, and filiform, with simply cylindrical joints (none of them dilated, pectinated, bifurcated or otherwise paradoxically developed in either sex). The dorsal apex of the abdomen is generally more or less acuminate, and in the ♀ the ovipositor projects from below it (looking like a stout needle with a blunt point). The scutellum is not distinctly separated from the rest of the mesonotum.

(Family Siricidae). 3.

— Front tibiae with two calcaria. Antennae with the joints seldom quite simple. (Often they are clavate, capitate, pectinate, serrate on one side, pilose, etc., etc., see Pl. XII, Fig. 1 to 11.) Ovipositor of ♀ usually concealed within a bivalved chitinous sheath, which is always visible from beneath, and may (or may not) project slightly beyond the dorsal apex of the abdomen. Scutellum always distinctly separated from the rest of the mesonotum . (Family Tenthredinidae). 4.

3. Costal area of fore-wing (*i. e.* the space between the costa and subcosta) divided by a longitudinal "vein," but with no "nerve" crossing it transversely. Last dorsal plate of the abdomen in the ♀ deeply foveated before its apex, which is compressed and drawn out into a straight nail-like process, from beneath which the ovipositor may be seen projecting. The latter is much stouter than that of *Ophrynopus*, but the structure in both cases is essentially the same.

* These specimens were all taken by Mr. R. E. Turner emerging from holes apparently made by beetles in a dead *Eucalyptus* tree in June or July!

The only species recorded from Australia (*australis*, W. F. Kirby = *juvencus*, L. !) is certainly a mere accidental importation from the Northern Hemisphere, and no part of the true indigenous Fauna. The ♀ is chalybeous (blue with green and purple reflections). The ♂ has a shining testaceous abdomen, and the legs are mostly black, while those of the ♀ are mostly yellowish. In both sexes the bases of the antennae are testaceous. (The Type of "*australis*"—a ♀—is in B.M.)

†2. SIREX, L. (= PAURURUS, Knw.).

— Costal area of fore-wing crossed by a transverse "nerve," but without a longitudinal "vein."

Mr. Rohwer has described in *Ann. and Mag. Nat. Hist.* (Nov. 1918) a new species of this genus from North Queensland (*obtusiventris*, Rohw. ♀). I have not seen the unique Type, but it is described as black with antennae and legs ferruginous; 8 mm. long; with the abdomen "rounded not tapering apically," this being a very unusual character in a *Xiphydria*. (As the species does not seem to have occurred elsewhere it is presumably indigenous.) For a full account of its other characters see the author's description (*l.c.*). . . . . 3. XIPHYDRIA, Latr.

4. Middle and hind tibiae with calcar-like spines *before* as well as *at* their apices (Pl. XII, Fig. 19, Pl. XV, Fig. 19) . . . 5.
— Middle and hind tibiae with no spines other than the apical calcaria. . . . . 12.
5. Antennae apparently only 3-jointed (all joints beyond the two short basal ones being fused together and not distinguishable). Fore-wings with a distinct "lanceolate cell" (Pl. XI, Fig. 3). (Subfamily *Arginae*). 6.
— Antennae with at least 5 distinct joints. Fore-wings without a lanceolate cell, the humeral nerve being undeveloped. (Mr. Rohwer divides the genera of this section between two of his "Families"—the *Perreyiidae* and the *Pergidae*, placing *Philomastix* and *Phylacteophaga* in the former, *Perga*, *Xyloperga* and *Cerealces* in the latter, but for certain reasons I hesitate at present to take this view, and prefer to leave their precise affinities undecided. . . . . 8.
6. Lanceolate cell crossed obliquely by a transverse nerve.* Hind-

* This character does not occur in any other genus of the *Arginae*!

wings with only one closed cell, a cubital. Middle tibiae (Pl. XII, Fig. 19) with *two* (!) spines before their apices, hind tibiae with only one. Antennae of the ♂ simple (not furcate) and scarcely if at all more pilose than in the ♀ (see Pl. XII, Fig. 4), and for a full description of the only species (*turneri*, Rohw n. sp.) cf. the author's account of it in *Ann. and Mag. N. H.* (l.c.) . . . . . 4. Zenarge, Rohwer, nov. gen.

— Lanceolate cell "contracted" as in *Arge*, Schrank (= *Hylotoma*, Auctt.) Hind-wings with *two* closed cells, a cubital and a medial. Antennae of ♂ much more pilose than those of the ♀. . . . . 7.

7. Only 3 complete cubital cells in the fore-wing (the 1st cubital nerve being absent or represented by a mere rudiment). In the hind-wing the recurrent nerve lies *beyond* the cubital (*i. e.* nearer to the margin of the wing). The last joint of the ♂ antennae is furcate (Pl. XII, Fig. 3).

5. Trichorhachus, W. F. Kirby.

[For Synopsis of the species see p. 259.]

— Four complete cubital cells in the fore-wing. In the hind-wing the recurrent and cubital nerves are "interstitial" (Pl. XI, Fig. 4). The last joint of the ♂ antenna is not furcate.

6. Antargidium, n. g.

The only known species of this genus (*apicale*, W. F. Kirby) was described by its author (*Ann. and Mag. N. H.*, July 1894) as a "*Hylotoma*" (i. e. *Arge!*). But I venture to think that it is better to treat it as a new and distinct genus. Not only is it very much smaller than any of the other forms at present referred to *Arge*, but it differs from all other *Argidae* in the neuration of the hind-wing. In none of these are the recurrent and cubital nerves interstitial; and in all (except *Trichorhachus*) the cubital lies beyond the recurrent, and so is nearer to the margin of the wing!

8. (5) Antennae never with more than 7 distinctly separated joints, usually with less, and either "clavate" from the 3rd joint to the apex (Pl. XV, Fig. 18), or "capitate," *i. e.* with *the apical joint only* swollen into a club (Pl. XV, Fig. 20). Apex of scutellum angled at each side and somewhat reflexed, the angles usually forming little lobate (knob-like or tooth-like) projections (= the "scutellar lobes"). . . . . 9.

— Antennae with more than 7 distinct joints, neither capitate nor clavate, but with the apices of all joints except the two

first and the last lobately produced in the ♂♂ and angularly projecting ("subserrate") in the ♀♀ . . . . . 10.

9. Antennae always capitate, with *six* joints preceding the club, all distinctly separated from it and from one another. Labial palpi with 4 joints, maxillary with 6, the former much thicker than the latter.

7. Xyloperga, Shipp = Heptacola, Konow.

[For Synopsis of the species see p. 265.]

— Antennae either capitate, or (in Kirby's Section II of the genus) clavate from the third joint to the apex. In both cases only 5-joints at most (in one species only 4) precede the apical joint. Labial palpi with only 3 joints, maxillary with only 4, the latter scarcely differing in thickness from the former . . . . . 8. Perga, Leach.

[For Synopsis of the species see p. 265.]

10 Antennae 8-jointed, long and slender; joints 4 to 7 produced at their apices in the ♂ into pointed lobes; in the ♀ they are nearly simple. Palpi as in *Perga* (labial 3-jointed, maxillary 4-jointed). In the fore-wings the 1st recurrent nerve is sharply (angularly) bent in the middle, and runs very obliquely into the cubital vein half-way between the 1st and 2nd cubital nerves; the 2nd recurrent is straight, and nearly interstitial with the 2nd cubital nerve. 9. Phylacteophaga, Froggatt.

[The only known species of *Phylacteophaga* is *eucalypti*, Froggatt, described in *Proc. Linn. Soc. N. S. W.*, Vol. 14 (1899).]

— Antennae with at least 10 joints. Both recurrent nerves are straight and neither is interstitial . . . . . 11.

11. Antennae in the ♂ (the other sex is unknown) 10- to 12-jointed, the intermediate joints short and stout with dilated apices. Scutellum coarsely and rugosely punctured, dull, bisected by a sharply-defined longitudinal narrow sulcation, its apex produced into lobes as in *Perga* and *Xyloperga*, but here the lobes are proportionately longer and more sharply pointed.

10. Cerealces, W. F. Kirby.

[For Synopsis of the species see p. 287.]

— Antennae with at least 15 joints, these in the ♂ resembling those of *Cerealces scutellata*. In the ♀ the antennae are considerably longer than in the ♂, the post-basal joints are slender and elongate, but those following become shorter and broader as they approach the apex. The scutellum is somewhat shining, its disc in certain aspects appears bituberculate, but it is not (as in *Cerealces*) divided by a sharp central

furrow, its apex is simply rounded with no projecting "lobes." Fore-wings with the 1st cubital cell very short and not completely closed, the very oblique 1st cubital n. breaking off short without reaching the cubitus. In the ♀ there is a conspicuous dusky fascia beneath the stigma (Pl. XI, Fig. 13). Labial palpi 3-jointed, maxillary palpi 4-jointed (Pl. XII, Fig. 15). . 11. PHILOMASTIX, Froggatt.

[For Synopsis of the species see p. 287.]

12. (4) Lanceolate cell absent, as in *Perga*, etc. . . . . 13.
— Lanceolate cell present. . . . . 14.

13. Antennae only 7-jointed, the intermediate joints all short and dilated towards their apices, forming together with the apical joint a sort of club. Fore-wings with one radial cell and four complete cubital cells, the second and third each receiving a recurrent nerve. Hind-wings with one closed cell (a cubital). Clypeus remarkably short and transverse, with the antennae (as in *Diphamorphus, vide infra*) inserted just above it, and therefore low down in the face. Scutellum punctured, subtriangular with a rounded apex and a narrow elevated margin.
12. PERGULA, n.g.

Type *Pergula turneri*, n. sp. [For description see p. 288.]

(I do not know to what Subfamily this little insect should be referred. The specimen is unique, and I have not been able to dissect out the palpi. In certain characters it resembles a very diminutive *Perga*, but the posterior tibiae have no ante-apical spines.)

— Antennae multiarticulate. In all ♂♂ and some ♀♀ they are pectinate (the pectination *single*—not, as in Palaearctic "*Lophyrus*," Auctt., *double!*), but in most of the ♀♀ they are merely serrate. Fore-wing with the 2nd cubital nerve entirely wanting, so that the 2nd and 3rd cubital cells combine to form a single long cell which receives both recurrent nerves.
13. PTERYGOPHORUS, Klug.

(Subfamily ?). [For Synopsis of the species see p. 289.]

14. Radial cell divided by a transverse nerve.

The only species having this character yet recorded from Australia is an undoubted alien, imported accidentally along with the fruit-trees (*Pyrus*, etc.) on which it feeds. It is a well-known pest in all parts of Europe and North America. The lanceolate cell is not petiolate, but is crossed by an

oblique nerve. The hind-wing has sometimes two closed cells, sometimes only one . . . . . †14. Caliroa, Costa = *Eriocampa*, Auctt. = *Eriocampoides*, Konow.

— Radial cell undivided. Lanceolate cell with no nerve crossing it, but "petiolate." Hind-wing never with more than one closed cell (cubital) . . . . . 15.

15. Antennae pectinated as in *Pterygophorus* but far less closely, the joints (apart from their branches) being longer. In the ♂ of the only described species, viz. *P. atratus*, W. F. Kirby, the antennae are 18-jointed. The ♀ is described by Mr. Rohwer in *Ann. and Mag. N. H.* (l.c.) from a specimen seen by him in B.M., but this, I fear, has since been destroyed or lost, for neither Mr. Turner nor I have been able to find it. Its antennae were broken from the 12th joint onwards, but each of the remaining joints after the second had "a ramus like *Pterygophorus*." Mr. Rohwer places it in his Subfamily "*Eurlinae*," and compares its wing-veining to that of the American genus *Perreyia*. (Kirby also brings *Perreyia*, *Eurys* and *Polyclonus* near together, including them all in the "Subfamily" which he calls *Lophyridinae*.*)

15. Polyclonus, W. F. Kirby.

— Antennae without pectinations, nearly simple (or, at most, subserrate) in both sexes (Pl. XII, Fig. 11). . . . . 16.

16. Antennae inserted low down on the face, just above the short transverse clypeus, and so not far from the labrum. Mandibles long and falcate, not toothed before the apex.

16. Diphamorphos, Rohwer.

[For Synopsis of the species see p. 294.]

— Insertions of antennae situated normally, *i. e.* considerably above the base of the clypeus, and nearly in the middle of the face . . . . . 17.

17. In the fore-wing the apex of the obliquely truncated radial cell is separated from the margin of the wing by a distinct (subtriangular) appendicular cell.

17. Eurys, Newman = *Eurygopsis*, W. F. Kirby.

The general coloration of all the known forms is metallic (aeneous, cupreous, or chalybeous). The antennae are said to be always 9-jointed, and I have found them to be almost invariably so in ♀ specimens. But out of four

* I do not understand the formation of this word. Did the author, perhaps, mean to write "*Lophyrinae*"?

♂♂ in B.M. Coll. referred by Mr. Rohwer to his "*deceptus*, n. sp." two have them 10-jointed, and I am almost certain that the two ♂♂ with 11-jointed antennae (the Types of *nitens*, W. F. Kirby, and *bella*, Rohwer) on which Kirby founded his "new genus" *Euryopsis*, are really the unidentified ♂♂ of two *Eurys* spp. of which ♀♀ only have been described—probably of *laetus*, Westw., and *nitidus*, W. F. Kirby respectively. I venture therefore to sink the name *Euryopsis* as a synonym of the earlier *Eurys*. (The so-called "*Eurys*" *inconspicua*, W. F. Kirby, is, in my opinion, a *Clarissa*.)

[For Synopsis of the species see p. 294.]

— In the fore-wing the apex of the simply acuminate radial cell is close to the margin of the wing, with at most a very narrow (linear) space, but no real appendicular "cell," separating it from the latter . . . . . 18.

18. Legs (especially the hind coxae and tarsi) very slender and elongate, the tarsi evidently longer than the tibiae. Antennae also long and slender, almost filiform as a whole, most of their joints considerably longer than broad. According to Mr. Rohwer the antennae should be 14-jointed, but in specimens examined by me in B.M. Coll. the number of joints varies from 12 to 15.

Generally the coloration of the body is thoroughly metallic, much as in *Eurys*. But in the ♀♀ of one species the abdomen beneath is testaceous.

18. Neoeurys, Rohw.

[For Synopsis of the species see p. 297.]

– Legs and also antennae somewhat shorter and stouter than in *Neoeurys*. The antennae can hardly be called filiform; they are rather moniliate, and the intermediate joints are only a little longer than broad. The tarsi seem never to be longer than the tibiae, in most cases they are evidently shorter. The general coloration of the four species seen by me is not metallic, but testaceous and black, except in *atrata*, which is black with white markings. The number of joints in the antennae varies extremely—from 9 in *inconspicua* to 14 in *thoracica*. Of *divergens* I have seen specimens with 10, 11, 12, and 13 joints (all from Queensland). The most usual number of joints in this species (and also in *atrata*) seems to be 11 . . . . . 19. Clarissa, W. F. Kirby.

[For Synopsis of the species see p. 299.]

INDEX OF GENERA TABULATED.

(Imported genera in italics.)

TRICHORHACHUS, W. F. KIRBY.

SYNOPSIS OF THE SPECIES.

All *Trichorhachus* species, except *nitidus* of which B.M. possesses one ♂ and one ♀, were described from single ♂ specimens, and any tabulation of their characters based on such inadequate material can only be quite provisional, since it is impossible to be certain which of these characters are really specific and constant, and which liable to variation or even merely individual. The Type of one (*australis*, Westw., described as a *Schizocera*) is at Oxford, all the others are in B.M., and all this material, such as it is, I have examined and compared with the original descriptions. But I have seen no other representatives of the genus, nor—so far as I know—has any one else!

Konow's treatment of *Trichorhachus* in his *Genera Insectorum* illustrates the danger of speculating on the affinities of a genus without having seen any representative of it. (It is only fair to say that in this case he expressly acknowledges himself unacquainted with the insects otherwise than in literature; but there are cases in which he has unfortunately been less explicit.) He begins by placing it in his division "*Argides*," which he separates from his "*Schizocerides*" as having an intercostal nerve in the fore-wing. But in fact such a nerve is not present in any specimen of *Trichorhachus*. Yet neither can it belong to the *Schizocerides* as defined by Konow, since its

posterior tibiae are always spined before their apices. Again he separates it from the genera with "contracted" humeral areas (= lanceolate cells) as having this area "petiolated." Really, however, it is not petiolated (though Kirby so describes it), but contracted. *Trichorhachus* is therefore a link between Konow's *Argides* and *Schizocerides*, and either the division between these must be given up, or the definition of one of them must be emended, or a distinct group, *Trichorhachides*, must be established one of whose distinguishing characters will be the peculiar neuration of the hind-wing (see the *Synopsis of Genera* given above, p. 254). Of these alternatives I should myself prefer the first, for the division of the *Arginae* into *Argides* and *Schizocerides* seems to me to bring together genera whose affinities are very remote, and to separate others which are probably very near relations. Such is almost sure, I believe, to be the result when very large groups are established on their agreement in a single arbitrarily selected character. In this particular case of the *Arginae*, which are perhaps the most widely distributed of all Sawflies, and which appear to have reached all parts of the world, and branched out here and there into new groups which are quite unrepresented elsewhere, I cannot think that any classification of their genera is likely to be natural which ignores their geographical distribution entirely.

As I only know one *Trichorhachus* ♀ (viz. *nitidus*, Kirby), and this seems to differ from its ♂ in nothing but the usual sexual characters (simple antennae, etc.), it must suffice here to tabulate such differences as I notice in the ♂♂, and it must always be remembered that some of these differences may not really be specific.

1. Antennae black . . . . . 2.
— Antennae yellowish . . . . . 3.
2. Wings with clear bases but clouded apices. Body above and below bright metallic blue, only the labrum, tempora, and extreme apex of abdomen yellow. Hind-legs entirely black. *australis*, Westwood.

Type at Oxford. "West Australia."

— Wings clear throughout. Body above nearly dead-black, but slightly nigro-aeneous on parts of the thorax, and extreme apices of abdominal segments a little discoloured. Labrum yellow, but the rest of the face quite black, though Kirby

describes it as yellowish. Abdomen rufescent beneath. Hind tibiae and tarsi yellow, except the apices of the former, which are black. . . . . *abdominalis*, W. F. Kirby.

Type in B.M. "West Australia, Swan River."

3. Legs, including the femora, pale yellow. This is apparently the smallest of the species—about 5½ mm. long.
nitidus, W. F. Kirby.

Type in B.M. "West Australia, Swan River."

— Larger forms—about 8 mm. long. At least the femora of all the legs are black or fuscous. . . . . 4.

4. Four posterior legs uniformly dark throughout. Face, tempora, hypopygium with the genitalia, etc., and the front tibiae and tarsi yellowish, the rest of the body metallic (chalybeous) with reflections varying in different lights between blue-green, indigo, etc. Wings clear . . . *hyalinus*, W. F. Kirby.

Type in B.M. "West Australia, Swan River."

— Hind tibiae paler beneath than above. Otherwise quite like *hyalinus*, except that the wings appear to be somewhat darker. . . . . *sobrinus*, W. F. Kirby.

Type in B.M. "Australia?"

The localities given above are cited from Kirby's List. It would seem from them that the genus is likely to be confined to a single locality (Swan River); but if so, and if the above are all really distinct species, it is hard to see why they should all be represented by "unica." (Of course more material may exist, though apparently unrecorded, in Australian museums; in which case it is very desirable that some competent local entomologist should revise the genus properly.)

PERGA, LEACH (AND *XYLOPERGA*, SHIPP).

SYNOPSIS OF THE SPECIES.

Perga differs from any Northern genus in many significant respects, *e.g.*—

1. Its larva (Pl. XV. Fig. 17) has no ventral prolegs, while in all true "Cimbicides" and "Abiides" of Konow's

classification these are present to the number of 16! This fact has long been known, and the larvae of various *Perga* spp. have been repeatedly described and figured.* It is therefore rather surprising to find Konow on page 41 of his unfinished Monograph (*Zeitsch. f. Hym. u. Dipt.*, Vol. I, p. 169), tabulating six species of *Perga* as having larvae "with 22 legs"! My photograph above cited is from one of a number of specimens (preserved in spirit) in B.M., and it will be seen that the character is unmistakable. Konow, I must suppose, had never seen one; but, having made up his mind that *Perga* belonged to his Subfamily *Cimbicini*, arrived by deduction from this premiss at the conclusion that its larva must have 22 legs!

2. Its posterior tibiae have "ante-apical spines"—a character absent not only in all *Cimbicides* and *Abiides*, but in all Palaearctic and Nearctic genera of Konow's *Tenthredinidae* except certain genera of the *Argini*.

3. The structure of its thorax differs obviously in the apical lobation of the scutellum, and also in certain other less conspicuous details. (I do not here dwell on the latter characters, as they are somewhat "critical," and have been dealt with by Mr. Rohwer in his recent classification of the Suborder in *Proc. Ent. Soc. Washington*, 1911.)

4. The neuration is wholly different. *Perga* has in the fore-wing (*a*) an undivided radial cell, (*b*) normally at least *four* cubital cells, (*c*) no lanceolate cell—the "humerus" being obsolete or undeveloped, and in the hind-wing (*d*) one cell only (a cubital).

All these characters (in some of which it agrees with all other Australian and some S. American genera) separate it absolutely from all true *Cimbicides* and *Abiides*, and quite outweigh any reason for uniting it with them which might be suggested by the form of its antennae!

5. Again, a normal *Perga* has a reduced number of joints in the labial and maxillary palpi, namely, 3 and 4 respectively, instead of 4 and 6, which latter is the number in all *Cimbicides* and *Abiides*, and, so far as is certainly known, in all Northern *Tenthredinidae* whatever! (*Xyloperga*, however, does not possess this peculiarity, but has 4 labial and 6 maxillary palpi (Pl. XII, Fig. 14) as in the Holarctic genera.) But it is not certain what inferences

* Cf. Scott's description and figures in *Proc. Zool. Soc.*, 1859, p. 211, and Pl. LXII; also those of Davis in *Entomologist*, Vol. I, p. 89, and of Froggatt in *Australian Insects*, p. 72 and Pl. X, etc.

ought to be drawn from this fact, so I here content myself with merely mentioning it.

This difference in the number of its palpi, combined with other characters which shall presently be noticed, certainly justifies the treatment of *Xyloperga*, as a good subgenus, and possibly as a good genus, though at present I am not convinced that it is either necessary or desirable to exclude it absolutely from *Perga*. Certainly some species of the latter (*e.g.* the *bella* group) seem to me to have really more characters in common with *Xyloperga*, than with others (e.g. *dorsalis*, etc.) in whose company such an arrangement would leave them. Therefore, in separating *Perga* and *Xyloperga* in my Synopsis of the Genera above, I have rather deferred to what I believe to be the opinion of more competent judges of such questions, than followed any conviction of my own. But, as to the other "segregations" which have been proposed mostly on single characters often insignificant, and sometimes quite imaginary,* such as the presence or absence of a distinct 1st cubital nerve in the wings of certain species, I must claim liberty to disregard them altogether, till the collection of more material makes it possible to say for certain, whether or no these characters (when they exist at all) are really characteristic of any natural groups of species. So far as I have been able to test them, I have always found them either "individual," or absolutely non-existent! So long as a majority of the species are known only from single specimens, and the total number of supposed species is no larger than at present, I can see no advantage whatever, and on the contrary considerable disadvantage, in prematurely establishing and naming sections, which may or may not correspond to real natural groups. On this kind of work I venture to think that "the last word" was said

* *E. g.* Leach says that *P. polita* has only 3 cubital cells. This is not really the case in his own Typical specimen, the 1st cubital nerve being merely interrupted in the middle, but not absent; and examination of other specimens shows that the aberration is not specific, but individual. However, on the strength of Leach's mistaken statement, Ashmead made *polita*, Leach, the Type of a "new genus," which he characterised by the absence of the 1st cubital nerve, and named "*Pseudoperga*." Perhaps, fortunately, the same name had been already employed by Guérin (1845) and Shipp (1894) to denote a different section of the genus, the Type of which is *lewisii*, Westw.; so that *Pseudoperga*, Ashmead, may safely be ignored as a homonym.

long ago by Aristotle's master Plato. He compares it to the methods of an unskilful butcher (*κακὸς μάγειρος*), cutting up his carcasses without regard to their "natural articulations" (*ἄρθρα ἢ πέφυκε*), and therefore not inserting his knife *between* the meeting-points of the limbs, but hacking *through* the bones themselves. This, I venture to think, exactly describes the manner in which Leach's genus has been dealt with by such writers as Shipp and Ashmead—of whom the former was evidently incompetent to deal with it at all, and the latter, though versed in the *literature* of the subject, seems to have had no actual acquaintance with any of the species, whose affinities he took upon himself to determine.

Xyloperga, Shipp, however (= *Heptacola*, Konow), is at any rate a real group, and differs from normal *Perga*, not only in its mouth-parts, and the other characters mentioned *infra* in my Table, but in sundry other details such as a peculiarity in the form of its clypeus, which is rather difficult to describe but easy to recognise when once thoroughly realised. It is (approximately) bisected transversely into two distinct areas, a basal and an apical, the latter being occupied (except at its extreme apical margin, which is a little recurved) by a sort of shallow sulcus above which the basal area rises somewhat abruptly to a higher level. The division between these higher and lower levels is nearly a straight line, so that the clypeus appears to have a double apical margin, or, in other words, to end before its real apex. Something of the kind occurs also in one group of *Perga* (*bella*, etc.), in which and also in certain spp. of "*Heptacola*" (i. e. *Xyloperga*) Konow describes the phenomenon as "Clypeus in der Mitte quer gebrochen," but he does not utilise it as a general characteristic of the latter genus.

The scutellum, also, of *Xyloperga* (as pointed out by Konow) is somewhat more narrowed posteriorly than in normal *Perga* spp. (subtriangular rather than oval or subquadrate), and this generally brings the "apical lobes" rather nearer together than in the other case.

Unfortunately most of the forms which make up *Xyloperga* are represented by at most one or two specimens in B.M. and at Oxford. The only species of which I have seen anything like a series is *unicittata*, W. F. Kirby, which Konow, quite wrongly, sinks as the ♂ of "*newmanni*," Westw. (= *ferruginea*, Leach). Konow is also mistaken

in commencing his List of "*Heptacola*" spp. with *H. macleayi*, Westw.; for the latter, as I have mentioned elsewhere, is neither a *Heptacola*, nor a *Perga*, but identical with Froggatt's Type-species of *Philomastix*, hitherto known as *glabra*, Froggatt. It must be known in future as *Philomastix macleayi*, Westw.

SYNOPSIS OF *PERGA* (AND *XYLOPERGA*) SPP.

♀♀.

1. Fore-wing with its third cubital nerve (Pl. XV, Fig. 14) rising at first perpendicularly from the cubitus, but soon becoming curved (or even suddenly angled) inwards and running obliquely towards the stigma. It is therefore not nearly parallel to the second cubital nerve. . . . . 2.
– Fore-wing with its third cubital nerve (Pl. XV, Fig. 15) approximately straight throughout, and parallel (or nearly so) to the second cubital nerve . . . . . 22.
2. Antennae short, but not paradoxically so *—generally about

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* Two species, both belonging to the section of *Perga* in which the third cubital nerve is sharply bent inwards, cannot at present be tabulated by their antennal characters, since the unique Type-specimen of each had lost its antennae before the species was described and figured. These are *P. walkerii*, Westwood, and *P. christii*, Westwood (Types of both at Oxford). I will therefore here mention other characters by which they may probably be recognised if they should be rediscovered.

1. *P. walkerii* is a rather large and robust form about 18 mm. long. The head (above), the pronotum, and the greater part of the legs (except the black hind femora), are fulvous. The whole mesonotum including the scutellum (!), the metanotum, the three basal segments of the abdomen above and all its ventral surface up to the sawsheath are black. The remaining (apical) segments of the abdomen above are reddish-fulvous. The wings are stained with yellow, their venation and the stigma brown. (Details of "saw," Pl. XIV, Fig. 12.)

2. *P. christii* has the abdomen entirely chalybeous. The head and thorax are blackish with very copious whitish markings. Of the latter colour are the clypeus, labrum, orbits of eyes, antennal tubercles, two spots on the vertex, the edges of the pronotum widely, a spot in the posterior corner of the middle mesonotal lobe, the whole scutellum with its apical lobe-like processes and the ridges which run obliquely from its basal corners towards the insertions of the wings. The basal half of each fore-wing is clear and colourless, but its apical half is distinctly infuscated throughout and especially so under the stigma. The veins and stigma are black. Length about 15 mm.

Konow treats this sp. as a synonym of *foersteri*, West. (i. e. *bella*,

as long as the distance between the compound eyes. Their 3rd, 4th and 5th joints are all longer than broad, distinctly separated from each other and from the apical joint, which forms a "club" by itself. The antennae are thus "capitate," and not simply "clavate" . . . . . 3.

— Antennae paradoxically short—about as long as the distance between their insertions. Some at least of the intermediate joints are broader than long, and as well as the apical joint they form part of the "club," which therefore commences immediately after the two short basal joints (cf. Pl. XV, Fig. 18). . . . . 15.

3. The hind tarsi (including the claw-joint) are evidently shorter than the hind tibiae. . . . . 4.

— The hind tarsi are approximately equal in length to the hind tibiae. (Group of *lewisii* and *ferruginea*. For details of the "saws" in this group, see Pl. XIV, Figs. 13, 14, 15.) 20.

4. Neither antennae nor scutellum ever black, but yellowish or brownish. (Saws as in Pl. XIV, Figs. 1 to 10.) . . . 5.

— Either antennae or scutellum (or both) are black. (Saws as in Pl. XIV, Figs. 16 and 11.) . . . . . 14.

5. Scutellum bisected by a wide and deep longitudinal furrow.

— Scutellum at most divided by a fine line or an inconspicuous depression, or not divided at all. . . . . 6.

6. The head above, the mesonotum (except its scutellum) and almost the whole abdomen above concolorous—metallic green or blue ("aeneous" or "chalybeous"). Fore-wings stained throughout with yellow. Middle of scutellum smooth and impunctate. . . . . 7.

— The head, the mesonotum (or at least its middle lobe), and usually the abdomen not aeneous nor chalybeous, but yellowish or brown (rarely with obscure violaceous reflections in certain lights). Wings in some species quite clear ("hyaline"), in others slightly clouded in parts, but seldom, if ever, really yellow . . . . . 9.

7. Mesopleura entirely pale, concolorous with the pronotum and scutellum. Abdomen more or less discoloured (beneath and

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Newman), but this is certainly a mistake, for the latter species belongs to the division of *Perga* in which the third cubital nerve is straight, whereas in *christii* this nerve is very strongly bent, even angled!

I am inclined to think that the species to which *christii* comes nearest is *dahlbomii*, Westwood, but it is impossible to be sure without having seen its antennae. Those of *dahlbomii* are extremely short (Section II of Kirby's List).

at the sides) in some specimens, but this may be due to immaturity. I do not believe that this is more than an aberration of the next species (*dorsalis*). It agrees with it exactly in all structural characters, details of "saws," etc. Nor can it be considered as a "subspecies" (= local race) since both forms occur in the same locality. *affinis*, W. F. Kirby.

Victoria. Type in B.M.

— Mesopleura at least partly, and abdomen entirely in all specimens seen by me, chalybeous or aeneous (concolorous with the mesonotum, head, etc.). . . . . 8.

8. Large form (about 24 mm. long). The general ground-colour in all specimens seen by me is rather green than blue. The details of the "saw" (Pl. XIV, Fig. 1) differ from those in all other spp. except *affinis*. This was the first species of *Perga* to be described, and is the Type of the genus.
dorsalis, Leach (? = *eucalypti*, Scott).

N. S. Wales and Victoria. Type (a ♂) in B.M.

— Very like *dorsalis* but smaller (about 20 mm. long) and with a very different saw (Pl. XIV, Fig. 7). One specimen in B.M. is coloured like *dorsalis*, but the others are all rather blue than green. . . . . *intricans*, n. n.

There are three examples of this form in B.M., two from Queensland and one from Adelaide, all ♀♀. At Oxford there is only one, also a ♀, from Adelaide, which Westwood —wrongly, I believe (*v. infra*)—considered to be the ♀ of his *schiödtei* ♂, though it is quite unlike the latter in coloration. It appears therefore necessary to give it a new name.

Queensland and Adelaide. Type in B.M.

9. Mesonotum with its side-lobes chalybeous. The middle lobe, head, and part of the abdomen testaceous.
schiödtei, Westw.

This I believe to be the true ♀ of *schiödtei*, Westw. It strongly resembles the ♂ in coloration and other characters. In B.M. there are, besides the unique ♀ specimen (S. W. Australia, Swan River), three ♂♂ exactly like Westwood's Type, and all, like the ♀, from S. W. Australia (one from Swan River). There is no similar ♀ at Oxford, and Westwood probably was unacquainted with it.

S. W. Australia (Swan River, etc.). Type (a ♂) at Oxford.

— All lobes of the mesonotum entirely testaceous, or rarely brown (no part chalybeous). . . . . 10.

10. Scutellum quite smooth and impunctate with no indication of a dividing line or furrow. Wings, at least towards their apices, slightly infuscated . . . . . *klugii*, Westw.

S. W. Australia (Swan River). Type at Oxford.

— Scutellum punctured, or bisected by a longitudinal line or a shallow furrow. Wings glassy and quite clear. . . . 11.

11. Scutellum with dense rugose punctures, bisected by a distinct though shallow longitudinal impression . . *kirbii*, Leach.

Victoria. Type (a ♂) in B.M., also one ♀.

— Punctures of scutellum more or less remote . . . . . 12.

12. Scutellum with a very few hardly noticeable punctures, bisected longitudinally by a fine impressed line.

brevitarsis, n. n.

The unique specimen in B.M. was referred by W. F. Kirby to *kirbii*, but is evidently not that species. It differs from all other forms by its extremely short tarsi, which look only about half as long as the tibiae!

S. W. Australia (Swan River). Type in B.M.

— Scutellum more largely and closely punctured than in *brevitarsis*, but not coarsely and rugosely as in true *kirbii*. Hind tarsi of normal length. . . . . *agnata*, n. sp.*

This also is a unique specimen. Its saw (Pl. XIV. Fig. 3) is more like that of *dorsalis* than those of the species to which it seems more nearly allied. Towards its *base*, however, which is not shown in the Figure, the teeth alter their shape and become bent as in *klugii*, etc. (Possibly this character is merely individual. More specimens are needed to settle the point.)

Victoria. Type in B.M.

* **Perga agnata**, n. sp.

♀ *P. kirbii*, Leach, notis paene omnibus—scilicet statura, colore lutescente, alis limpidis, etc.—simillima.

Differt scutello sparsius punctato, lobis eiusdem apicalibus minus productis, denique terebrae denticulis aliter formatis—scilicet haud uncinatis omnibus, sed plerisque (ut in *P. dorsali* et *affini*) lenissime tantum curvatis, immo paene rectis.

♂ differt a *P. kirbii* ♂ scutello multo sparsius punctato.

13. (5) General colour yellowish-brown * with certain areas paler (clear light yellow) especially the scutellum, the posterior corner of the middle mesonotal lobe, and a series of marks on the sides of the abdomen (where the lateral margins of the dorsal plates fold over and become ventral in situation). Hind femora widely blackened, tibiae so only at extreme apex. Wings yellowish, but otherwise almost clear. The longitudinal furrow on the scutellum is very noticeable, linear at its base and growing wider and deeper as it approaches the apex, but its lateral limits are not sharply defined. (The absence mentioned by Leach of a 1st cubital nerve is not a constant character, though Ashmead has treated it as generic! Even in Leach's own Type the nerve is not really absent in either wing, and in most specimens it is quite normally developed.) . . . . . *polita*, Leach.

Eastern Australia (from Victoria to Cairns in Queensland). Type, and many other specimens in B.M.

— Very like *polita* but darker than normal specimens, and the scutellum is not yellow but brown like the areas adjacent to it. Hind femora and tibiae concolorous, pale throughout in all specimens examined. Lateral marks on abdomen much as in *polita*. Wings distinctly and even strongly infuscated under the stigma. The furrow on the scutellum seems distinguishable from that in *polita* by its more sharply defined diverging margins. . . . *castanea*, W. F. Kirby.

Kirby described what I take to be certainly the ♂ of this species under the name *divaricata*, but associated with it a ♀ belonging to quite another group, namely a *bella*. (*Vide infra*, 31, and cf. Pl. XV, Fig. 6, with Pl. XIV. Fig. 17, and Pl. XV, Figs. 5, 7, 9.)

Victoria. Type in B.M.

14. (4) Abdomen black with no part *red*, but segments 7 and 8 (above) each with a broad apical band of pale yellow, that on segment 7 deeply excised anteriorly (almost interrupted). The 5 preceding segments are quite black above, but streaked with yellow on the sides and venter. Scutellum yellow, but

* The dorsum in Leach's Type-specimen is darker than usual, and shows obscure metallic reflections (violaceous). Probably this results from the great age of the specimen. It must have been in the Museum for more than a century.

labrum and antennae entirely black. Length about 15 mm. Saw, Pl. XIV, Fig. 16 . . . . . *antiopa*, n. sp.*

S. W. Australia (Yallingup and Kalamunda). Type (and other specimens of both sexes) in B.M.

— Abdomen belted with red, black at base and apex, and without any yellow markings. Scutellum margined with yellow. Head above black. Hind tibiae and tarsi dark red (not "entirely black" as stated by Konow). Wings dusky, blackish brown, especially under the stigma. Length about 14 mm. Saw, Pl. XIV, Fig. 11 . . . *esenbeckii*, Westw.

S. W. Australia (Swan River). Type at Oxford. Another ♀ in B.M.

15. Antennae with only five † joints visible. Wings in West-

*** Perga antiopa,** n. sp.

♀ Nigra, labro antennisque concoloribus. Lutea vel eburnea sunt—tubercula antennalia, parsque genarum his adjacens; clypei latera; mandibularum maculae basales; striga longa (superne abbreviata) postocularis; pronoti margo posterior; scutellum; pleurorum pedumque major pars (apicibus vero tibiarum posticarum tarsorumque nigris); segmentorum abdominis dorsalium 7^mi^ et 8^vi^ margines apicales; et in segmentis praecedentibus maculae magnae laterales ventralesque, quae tamen desuper spectanti vix (aut ne vix quidem) apparent.

Scutellum sparse punctatum, sulco mediano divisum. Alae brunneo subfuscatae. Clypei apex subexcisus. Antennae capitatae, normales, articulo 3^tio^ sequentibus duobus conjunctis subaequali.

♂ Pictura corporis cum ♀ satis bene congruit; differt vero capite et thorace plus minusve copiose rufo-variegatis, etiamque antennis post articulum 2^dum^, pedibus totis, mesonoto pleurisque partim rufis, clypeo et plerumque labro immaculatis, flavis, ventre copiosius flavo-picto.

† Konow questions this, but Westwood's statement is perfectly correct, and his enlarged figure of the antenna shows the character clearly. (Cf. also my Fig. 18, in Pl. XV which is drawn from Kirby's Type-specimen of *bisecta*.)

Authors have blundered strangely about this species. W. F. Kirby placed his *bisecta* in his Section I, as though its antennae had been of normal length and shape, while he actually enumerates *mayrii* among the species of his Section III, as though its antennae were *seven*-jointed! Shipp makes confusion even worse confounded. Although Westwood's Type was actually in his charge, and he might have counted for himself the joints of its antennae and the nerves of its cubital area, he adopts, instead, Kirby's erroneous classification and Westwood's figure of the wing in which the neuration is imperfectly represented, and erects accordingly an imaginary "genus"—of which he names *mayrii*, Westw., as the

wood's Type-specimen with the 1st cubital nerve very faint, *nearly* obliterated ("*fere obliterata*," as the author correctly states), but not quite so, though his Figure does not show it at all. (In Kirby's Type of *bisecta* this nerve is quite distinct and normal!) The body is almost entirely fulvous, but with the pleura, sterna, metanotum, propodeum, hind femora, a spot and streak on the middle mesonotal lobe, and the edges of the scutellum as well as a large mark on its disc, more or less completely blackened. The wings have a yellow stain, and their neuration and the stigma are brownish. A larger and more robust species than most of this group (Section II in Kirby's List)—about 18 mm. long. I have not been able to examine the saw, and cannot describe its characters. . . . *mayrii*, Westw. = *bisecta* W. F. Kirby.

I have carefully compared the Types of *mayrii*, Westw., and *bisecta*, Kirby, and am certain that the two belong to one species. Both specimens were taken by the same collector (Mr. Du Boulay) in West Australia; *mayrii* at Swan River, *bisecta* at Nicol Bay.

W. Australia. Type of *mayrii* at Oxford. Type of *bisecta* in B.M.

— Antennae with six joints . . . . . 16.
16. Thorax nearly unicolorous, lighter or darker testaceous throughout . . . . . 17.
— Thorax black with yellow markings . . . . . 18.
17. General colour pale testaceous. Head and mesonotum opaque, very closely punctured and rugulose. Hind tarsi pale. *belinda*, W. F Kirby.

The details of the saw in this species curiously resemble those which appear elsewhere only in the group of *bella*. Cf. Pl. XIV, Fig. 17, and Pl. XV, Figs. 5, 6, 7 and 9. But its other characters, and especially the form of the 3rd cubital cell, suggest that it can only be very remotely connected with that group.

S. Australia (Adelaide). Type in B. M.

type—characterised by seven-jointed antennae and only three cubital cells!! It seems to me altogether unreasonable that, when a so-called "genus" is thus founded solely on blunders and misrepresentations, and corresponds to no real group of natural objects whatever, it should be allowed "standing in nomenclature" merely because the author has gone through the form of "selecting a type." Such work is certainly no contribution to science, and does not deserve to be treated seriously as literature.

— General colour much darker—a ruddy brown. Head and mesonotum shining; the punctures on the latter large, but very sparse. Hind tarsi blackish. . . . *lucida*, Rohwer.

The Type is unique, and I have been unable to examine the details of its saw properly, but what I can see of them reminds me of the *lewisii* group, and especially of *ferruginea*, which it resembles also in coloration, though its sculpture-characters are very different.

N. S. Wales. Type in B.M.

18. Dorsum of abdomen red, except at the base and apex which are black. Head and thorax black with copious yellow markings (two large spots behind the ocelli, another in the posterior corner of the middle mesonotal lobe, etc.). Length about 16 mm. Wings quite clear. . . *cressonii*, Westw.

Perhaps, as Konow thought, this is the ♀ of *brullei*, Westw. But its femora are black, which is not the case in *brullei* ♂, and this is a character in which the two sexes of a *Perga*-species generally agree.

Adelaide. Type at Oxford.

— Dorsum of abdomen entirely, or at least throughout its longitudinal diameter, dark violaceous or chalybeous . . . 19.

19. Clypeus, labrum, apices of hind tibiae and tarsi, and also—*teste* Westwood *—the antennae, black. Abdomen nigro-violaceous. Wings not distinctly infuscated. Scutellum

* I have only seen one ♀ certainly referable to *dahlbomii*, Westw., namely the original author's Type-specimen, and this, as well as the ♂ which he described with it, has now lost both its antennae. Two ♂♂, however, in B.M. agree precisely with Westwood's ♂ in other characters, and both these have black (or at least blackish) antennae. Neither these ♂♂, nor either of Westwood's specimens, are stated to have come from any particular district in Australia. Two ♀♀ in B.M. were supposed by W. F. Kirby to belong to the same species, but they differ greatly in coloration from the type, having the antennae, clypeus, labrum, and the whole of the tibiae and tarsi yellow. (Also in one of them the sides of the abdomen are broadly rufescent.). On the whole they agree better with *christii*, Westwood, and come from the same locality, viz. Swan River. But they differ from Westwood's Type of *christii* in several characters—having, *e. g.* entirely clear and colourless wings, no yellow streaks between the insertions of the wings and the basal corners of the scutellum, the apical lobes of the latter not yellow, as in typical *christii*, but black, and the abdomen rather violaceous than cyaneous. On the whole I can only think them to be neither *dahlbomii* nor *christii*, but a distinct species of the same group from which I propose the name *vacillans*.

flatter than usual, without the usual distinctly projecting apical lobes, but with its whole extreme apical margin slightly raised, and ending on either side in a sort of obtuse angle only— not an actual protuberance . . *dahlbomii*, Westw.

Precise *habitat* not recorded. Type (♀) and Co-type (♂) at Oxford.

— Clypeus, labrum, apices of hind tibiae, and tarsi not black but yellow, as are also the antennae. Abdomen cyaneous. Fore-wings with the bases clear but the apical half distinctly clouded especially below the stigma. Scutellum with normal (yellow) apical lobes, an oblique narrow yellow streak runs from each of its basal corners towards the tegulae.
christii, Westwood.

W. Australia (Swan River). Type at Oxford.

20. (3) Antennae black. Length only about 14 mm. Otherwise hardly to be distinguished from the species next following (*lewisii*). Both are almost entirely brownish-yellow above, the head and thorax rugosely sculptured and dull, the abdomen smooth and somewhat shining, the apices of the hind tibiae and tarsi black. In both the clypeus is rather dull, and scattered over it are rounded pits or "foveae," each containing at its bottom a puncture from which proceeds a longish hair. . . . *guerinii*, Westw. = *smithii*, Westw.

This ♀ is called by Westwood *smithii*, but I feel little doubt that it is the ♀ of the ♂ which he had already described under the name *guerinii*, and the latter name must therefore be adopted.

Konow considered *guerinii* to be the ♂ of *lewisii* (described long before from a ♀), and treated *smithii* as the ♀ of *ventralis* ♂ described by Guérin in 1845. But the measurements given by their authors for *ventralis* ♂ and *guerinii* ♂—the former being evidently the larger insect—and also the agreement of *guerinii* with *smithii* and not with *lewisii* in the rather unusual character of entirely black antennae, make me sure that Konow was mistaken, and that he has reversed the facts. (At the same time there seems to be at present no positive proof that the above ♂♂ and ♀♀—which differ altogether in colour—are really in any way connected. That they are so, seems to be merely an inference from their agreement in certain characters·

which are not all of equal importance.* In both cases the ♀♀ seem to be extremely common, while the ♂♂ are hardly known at all. It is most desirable that these doubts should be cleared up by rearing larvae of both forms on a large scale, which would be sure sooner or later to procure the evidence that is wanted. (Kirby's "*sericea*" ♂ in B.M. appears to me identical with *guerinii* ♂ of Westwood, and I think it likely that "*chalybea*" ♂, Froggatt, is either the same, or perhaps more probably the true *ventralis*. Unfortunately Mr. Froggatt does not mention the colour of the antennae in his species.)

The Types of *guerinii* (♂) and *smithii* (♀) are both at Oxford. Westwood gives no particular locality for either, but specimens of *smithii* in B.M. are from Victoria.

— Antennae not black, but luteous or ferruginous . . . . 21.

21. Larger (about 19 mm. long) and paler. Yellowish with the apices of hind tibiae and tarsi, and usually the sides of the mesonotum blackened . . . *lewisii*, Westwood (1836).

Tasmania and Victoria.

— Smaller and darker, brownish-testaceous, with legs and sides of mesonotum concolorous. (*P. froggatti* (♀), Rohwer, in my opinion certainly belongs to this species, and "*newmanni*," Westw., and "*sellata*," Kirby, are ♂♂ of the same insect.) *ferruginea*, Leach = *froggatti*, Rohwer.

N. S. Wales and Victoria. The Type of *ferruginea*, Leach, according to Kirby, is a ♀ in B.M. Westwood, however, says that it is a ♂ at Oxford; but he cannot be right as to this, for Leach describes a ♀ only, and says distinctly *Mas latet!* The Types of *froggatti* (♀) and *sellata* (♂) are in B.M. That of *newmanni* ♂ is at Oxford.

22. (1) Antennae with only 5 joints really separated from the "club," but the latter is sometimes constricted (on one side only, not all round!) so that in certain aspects the antennae look seven-jointed. A more important character is the

* The character of "three cubital cells only," on which Guérin founded his Subgenus *Pseudoperga* for *lewisii* and *ventralis*, is certainly not reliable. The first cubital nerve is not always absent in any species of the group, and very seldom so in *ferruginea*, Leach, which clearly belongs to it.

following—N.B. labial palpi scarcely thicker than the maxillary and with *only three* joints, maxillary with *only four.* (The same is the case with all the species tabulated above!) . . . . . 23.

— Antennae with 6 joints distinctly separated from the club. Labial palpi much thicker than the maxillary, and *four*-jointed; maxillary palpi *six*-jointed (Genus, or Subgenus?, *Xyloperga*, Shipp = *Heptacola*, Konow). In this latter character the Group agrees with practically all non-Australian Tenthredinidae except a few in Central and South America! . . . . . 32.

23. Antennae far longer than in any other species; all their joints before the club slender and elongate (joints 3 and 4 subequal, 5 a little longer, and more than half as long as the club). All these joints and the base of the club are black, its apex is white (Pl. XV, Fig. 20). Abdomen bright testaceous above, whitish beneath, blackened on each side, these lateral black vittae successively widening posteriorly and so spreading more and more on to the dorsum, till on the penultimate segments they actually meet.

cameronii, Westwood = *leucomelas*, Rohwer.

This is a very distinct and remarkable species. Unfortunately in Westwood's Type-specimen the antennae are wholly wanting and were so when he figured and described it. But in the Type-specimen of *leucomelas*, Rohwer, which I have carefully compared with Westwood's Type of *cameronii*, and which, I feel sure, is conspecific with it, the antennae are perfect, and at once suffice to distinguish the species from any other. Cf. Pl. XV, Fig. 20 (drawn from the Type of *leucomelas*).

Type of *cameronii* at Oxford, of *leucomelas* in B.M. Westwood cites no particular locality for *cameronii*. The Type of *leucomelas* is from Queensland (Cairns).

— Species with normal antennae, and very different coloration from *cameronii* . . . . . 24.

24. All tibiae and tarsi quite black. Abdomen red and very shining. Antennae and scutellum black. Fore-wings with a strong brownish clouding below the stigma. Length about 14–15 mm. Saw, Pl. XV, Fig. 4. . . . . *glabra*, W. F. Kirby.

Queensland (Mackay) and N. S. Wales (Sydney). Type in B.M.

— All tibiae at least (usually the tarsi also) entirely pale, or blackened only at their apices . . . . . 25.

25. Antennae black . . . . . 26.

— Antennae never black, but yellow or testaceous . . . . 27.

26. Scutellum pale, labrum and abdomen entirely black, saw (very peculiar) Pl. XV, Fig. 10. . . . . *bicolor*, Leach.

Victoria and N. S. Wales. Type in B.M.

— Scutellum black, labrum yellow, abdomen yellow at base and apex. . . . . *spinolae*, Westw.

Victoria. Type at Oxford.

27. Small species, about 13 mm. long. Hind tibiae blackened at apex. Body almost entirely testaceous, except that the pronotum is bordered with yellow. Westwood described this ♀ as a new species (viz. *dalmanni*), but I think Konow is right in considering it to be the ♀ of *latreillei* described (from a ♂ only) by Leach.

latreillei, Leach = *dalmanni*, Westw.

Adelaide to Sydney. Type of *latreillei* (♂) in B.M. Type of *dalmanni* (♀) at Oxford.

— Larger forms, about 17 mm. long or more. Hind tibiae pale at apex. . . . . 28.

28. Abdomen without white or yellow lateral markings: it is either testaceous entirely, or testaceous with the apex black, above, beneath, and at the sides . . . . . 29.

— Each side of the abdomen is ornamented with a continuous series of uniform white or yellow marks. These are situated on the lateral margins of the successive *dorsal* plates; but, since the latter are folded inwards under the abdomen, the marks to be fully seen must be viewed ventrally.* . . 30.

29. Hind femora broadly blackened, contrasting strongly with the testaceous tibiae and tarsi. Thorax above, including the pronotum and scutellum, almost entirely black, dull and deeply punctured. Abdomen testaceous throughout. Forewings with a strong yellow stain except at their margins which are faintly violaceous in certain lights. Saw, Pl. XV, Fig. 8. About 16 mm. long . . . . . *hartigii*, Westw.

Type at Oxford.

* Similar marks have been already mentioned as occurring in some species of other groups (*polita*, *antiopa*, etc.).

— Hind femora immaculate, testaceous, concolorous with the tibiae and tarsi. Abdomen testaceous, black at the apex.

In size, habit, and most external characters, this species much resembles *hartigii*, but its saw (Pl. XV, Fig. 9) is altogether different, and almost identical with that of *bella*.

gravenhorstii, Westw.

Type at Oxford.

30. Head, mesonotum (except its lateral areas which are sometimes blackened), scutellum, and abdomen, testaceous with copious yellow markings, *e. g.* a pair of spots behind the ocelli, an elongate oval mark on the middle mesonotal lobe, a series of marks (as in *polita*, *antiopa*, etc.) on the infolded margins of the abdominal dorsal plates, etc. Saw, Pl. XV, Fig. 6. . . . . *bella*,* Newman (1841)
= "*divaricata*" ♀ (*nec* ♂), W. F. Kirby (1893).

(The ♀ associated by Kirby with his "*divaricata*" ♂ belongs in my opinion to this species. His ♂—which is the Type—I have already identified as the male of *castanea*.)

Victoria: S. Australia (Adelaide).

— Yellow markings much as in *bella*, but the general colour of the body is not testaceous, but very dark, black, or nigro-chalybeous, or nigro-violaceous . . . . . 31.

31. Hind femora black. Yellow marks of head thorax and abdomen as in *bella*, but the ground-colour very different, that of the thorax black, that of the abdomen above chalybeous. Scutellum black, except its apical lobes and a triangular space

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* The Type of *bella* seems to have long ago disappeared. It was from Adelaide, "a single ♀ in the cabinet of the Entomological Club." In 1844 the Club presented its collection to B.M. But according to Kirby's List (1882) the three specimens of *bella* from Adelaide then (and still) in the Museum were all "purchased." If so—and Kirby's statement is borne out by the Museum "Register of Accessions"—none of these can be the Type, which would have been registered as "*presented*," and not as "*purchased*." (F. Smith seems to have confounded *bella* with *ferruginea*, and Westwood states that the two forms are very near to each other. But I can see no likeness whatever between them, and they certainly belong to quite different groups, since they agree neither in neuration nor saw-characters.)

(stretching from these lobes to the base of the scutellum), which are yellow . . . . . *bella*, var. ? *

N. S. Wales. Type in B.M.

— Femora tibiae and tarsi concolorous, testaceous. Middle lobe of mesonotum not spotted in the middle with yellow, but testaceous at its sides. Ground-colour of thorax and abdomen black, with a violaceous tinge in certain lights. Pale markings of head and abdomen as in typical *bella*.

rubripes, Rohwer.

Tasmania. Type in B.M.

32 (22) Dorsum of abdomen for the most part yellow or testaceous . . . . . 33.

— Dorsum of abdomen chalybeous; at most its sides and ventral surface are pale or red . . . . . 36.

33. Antennae blackish. Body except the base of the abdomen almost entirely yellow. Size appears to vary greatly—from 15 to 20 mm. long. Details of saw Pl. XV, Fig. 12.

aurulenta, n. sp.†

* This specimen in the B.M. collection is labelled "*bella*, var. *nigra*, Rohw." But I believe that this name is unpublished. It is exceedingly like *rubripes*, and I doubt if it really differs from the latter specifically. In fact, since all these forms agree absolutely in practically everything but colour, and especially in the highly characteristic structure of their saws, I am tempted to think that Kirby, Westwood, etc., were right in including them all as forms of *bella*.

The ♂ of *bella* is probably, as suggested by Konow, *foersteri*, Westw. But if so, of course Newman's much older name (*bella*) should be adopted for the species. Konow also sinks the name *christii*, Westw., as a synonym of "*foersteri*," i. e. *bella*. But this is certainly a mistake, for *christii* (see above, 19) belongs to the section of *Perga* in which the 3rd cubital nerve is bent (Pl. XV, Fig. 14), while in "*foersteri*" and *bella* (♀) this nerve is straight (Pl. XV, Fig. 15).

† **Perga (Xyloperga) aurulenta**, n. sp. ♀.

Pallide flava paene tota, sed partibus his denigratis—antennis; suturis abbreviatis inter antennas ocellosque posticos, suturis occipitalibus et macula prope occipitale foramen sita; fascia bilobata ante pronoti marginem basalem, vitta lata triangulari in mesonoti lobo medio, aliaque macula (multo minore) ante scutellum; fascia basali in dorso abdominis; pedum posticorum femoribus, tibiarum apicibus, et parte tarsorum. Clypei dimidium basale elevatum, et a dimidio apicali concavinsculo truncatura fere rectilineari transversa separatum. Scutellum apicem versus angustatum, lobis eiusdem apicalibus satis longis. Alae flavescentes, venis et stigmate aurantiacis. ♂ ignotus.

I have seen two specimens only (both ♀♀) of this very distinct species, which were received at the B.M. in 1911 from Mr. H. J. Hillier. Except these, I have seen no Sawflies at all from Central Australia; and though evidently congeneric with the *Xyloperga* spp. of the coast districts (Swan River, etc.), they differ exceedingly from them all in coloration, resembling rather in this respect certain groups of Hymenoptera which are chiefly found in the sandy deserts of tropical and subtropical Africa and Asia.

Central Australia (Hermannsburg). Type in B.M.

— Antennae not blackish, but ferruginous or yellow . . . . 34.

34. Apices of hind tibiae blackened. Head thorax abdomen and legs for the most part nearly concolorous (ferruginous), but the abdomen in some specimens is more or less clouded or streaked transversely with black. Length about 15 mm. Details of saw, Pl. XV, Fig. 13. . *unirittata*, W. F. Kirby.

(The resemblance between this insect and "*neurmanni*," Westwood (i. e. *ferruginea*, Leach), of which Konow supposed it to be the ♀ is quite superficial. In all structural characters they wholly differ.)

Queensland (Mackay). Type and other specimens (♂♂ and ♀♀) in B.M.

— Legs quite pale, not blackened at the apices of the hind tibiae. Head above for the most part black . . . . . 35.

35. Mesonotum with the middle lobe only anteriorly, and the side lobes only posteriorly, blackened, otherwise concolorous with the dull pale-brownish scutellum. Tempora and a streak behind each of the posterior ocelli whitish yellow, otherwise the head above is black. Length about 12½ mm.

leachii, Westw.

Victoria. Type in B.M.

— Mesonotum quite black, scutellum clear yellow. A handsome, highly-coloured insect. Larger (about 14 mm. long) than *leachii*, though Westwood says it is smaller, evidently by a mere slip, as he also gives correctly the measurements of the two in lines. Details of saw, Pl. XV, Fig. 11.

halidaii, Westw.

(The *halidaii* of B.M. Catalogue has nothing to do with this species. It is merely a small *latreillii*.)

S. Australia (Adelaide). Type at Oxford.

36. (32) Legs and venter violaceous black. Tempora, scutellum, and sides of abdomen, bright reddish-orange. Scutellum unusually wide at the apex, its lobate processes far apart. Length about 15 mm. . . . . *jucunda*, W. F. Kirby.

W. Australia (Swan River). Type in B.M.

— Legs and venter at least partly pale or red . . . . . 37.
37. Hind tibiae not blackened at their apices . . . . . 38.
— Hind tibiae blackened at their apices . . . . . 40.
38. Legs and venter bright orange-red. Length about 13 mm. *amenaida* = *rufomaculata*, W. F. Kirby.

This ♀ was described by W. F. Kirby as *rufomaculata*, but Konow was right, I think, in treating it as the ♀ of *amenaida* (♂), which name precedes *rufomaculata* in Kirby's List.

Adelaide. Type in B.M.

— Legs and venter not reddish, but pale luteous . . . . 39.
39. Antennae scutellum and venter entirely luteous. Length about 14½ mm. Tempora, a pair of longitudinal streaks behind the posterior ocelli, edge of pronotum very narrowly and oblique lateral carinations of mesonotum yellow. Body nearly dead-black, the abdomen having a very slight tinge of metallic purple only noticeable in a strong light. *jurinei*, Westw.

N.W. Australia? Type (a ♂) at Oxford (♀ in B.M.).

— Antennae, part at least of scutellum, and sides of ventral segments black. Abdomen with a very noticeably metallic coloration, purple in some lights, blue in others; the propodeum, however, the mesonotum, the pronotum (except its luteous edges), and the dark markings on various parts of the fulvous head are simply black. . *semipurpurata*, n. sp.*

Of two specimens in B.M. one (the Type) is larger, fully 15 mm. long; its scutellum is yellow, bisected longitudinally by a broadish stripe of black; its antennae

* **Xyloperga semipurpurata**, n. sp.

Caput fulvum nigro-variegatum; thorax niger luteo-pictus; propodeum nigrum, reliqui abdominis dorsum (exceptis lateribus et apice luteis, pulcherrime metallescens (purpureo-cyaneum), venter luteus nigro anguste marginatus. Pedes post coxas toti lutei. Alae superiores lutescentes, inferiores albo-vitreae. Long. 15–12 mm. (Scutellum vel flavum nigro-vittatum, vel interdum totum nigrum.)

entirely black. The other is much smaller, only about 12 mm. long, and its scutellum is entirely black. (The antennae in this specimen are broken, but what remains of them is black.) In all other characters the two specimens agree exactly, they were taken in the same place, and I have no doubt that they belong to one species. The smaller form is probably an aberration merely. If a name be needed for it, it may be called *semipurpurata*, var. *melanaspis*.

S. W. Australia (Yallingup). Types in B.M.

40. (37) Antennae entirely yellow. Middle lobe of mesonotum margined with yellow, side-lobes and basal segments of abdomen more or less rufescent. Length about 12 mm. *lalage*, W. F. Kirby (?) *

— Much larger than *lalage*, and with the antennae not entirely yellow . . . . . 41.

41. Antennae black except the basal joint. Middle lobe of the mesonotum in the unique Type apparently entirely black (but, being pinned through this part, it cannot be examined quite satisfactorily). Not unlike a very large *semipurpurata*; the colour of the abdomen above is a fine rich purple, as in that species, but the venter seems to be marked with black only at its base, the scutellum has no black central vitta (though the commencement of one seems to be indicated by a little black triangle at its extreme base), and the head above is almost entirely luteous between the ocellar area and the occiput, with only a narrow black longitudinal vitta bisecting the vertex, while in *semipurpurata* there are also a pair of subtriangular black maculae running from the occiput to the eyes and covering a part of their orbits. This, except *aurulenta*, is the largest *Xyloperga* which I have examined, fully 18 mm. long . . *dentata*, W. F. Kirby.

S. Australia (Adelaide). Type in B.M.

— Antennae fulvous except the two basal joints and extreme apex of each which are black. Middle lobe of the mesonotum with a yellow mark in its posterior angle. Smaller than *dentata* (about 16 mm. long) and with the metallic colour of

* The type of *lalage* is a ♂ from Melbourne. The ♀ which I venture to associate with it was received in B.M. after Kirby's death, and is from a very different locality, viz. Cairns in N. Queensland. Still it appears to me conspecific with Kirby's Type.

the abdomen different—not rich purple, but a sort of dark indigo. The scutellum is yellow, with no black central vitta, but bisected longitudinally by a sharply defined sulcation . . . . . *buyssoni*, Konow (?)*

VICTORIA.

♂♂.

(For *localities* of spp., so far as I know them, see the Table of ♀♀ above.)

1. Third cubital nerve bent as in Pl. XV, Fig. 14 . . . . 2.
— Third cubital nerve approximately straight . . . . . 15.
2. Hind tibiae considerably longer than hind tarsi (claw-joint included) . . . . . 3.
— Hind tibiae about as long as hind tarsi . . . . . 14.
3. Antennae of normal length, capitate, 3rd and following joints before the club distinctly separated, and never broader than long . . . . . 4.
— Antennae paradoxically short, more or less clavate from the 3rd joint onwards, the joints usually indistinctly separated and broader (at their apices) than long . . . . . 12.
4. Intermediate segments of abdomen above clothed with dense rows of pale decumbent hairs, the hairs in each row of equal length and lying parallel to one another (longitudinally). (A character not unlike this occurs in ♂♂ of the non-Australian genus *Abia!*) Large forms (about 20 mm. long in average specimens) . . . . . 5.
— Intermediate segments of abdomen above glabrous . . . 6.
5. Head above and mesonotum (except its yellow scutellum) unicolorous (metallic greenish). (Abdomen usually coloured similarly, but one specimen in B.M. from Melbourne has it entirely reddish!) Mesopleura with or without yellow markings, but never perhaps entirely yellow (Type in B.M.). *dorsalis*, Leach.
— Head and mesonotum coloured as in *dorsalis*, but mesopleura entirely yellow, and abdomen with its sides and apex rather brightly rufescent. (Whether the unique B.M. "Type" from Tasmania really belongs to its supposed ♀ and differs specifically from *dorsalis* seems very doubtful) *affinis*, W. F. Kirby.

* I have not seen the Type of *buyssoni*, which is presumably at Berlin: but a single unnamed specimen in B.M. answers fairly well to his description. The locality cited for it by Konow is Tasmania.

6. Scutellum bisected longitudinally by a deep and wide sulcation. Fore-wing with a conspicuous * patch of scale-like hairs (situated on the underside of the wing, but visible *through it* from above) which occupies part of the radial and cubital areas (Pl. XI, Fig. 5) . . . . . 7.

— Scutellum not deeply sulcate—at most with a slight central impression. Fore-wing with no *conspicuous* aggregation of hairs, as described above, though several species when carefully examined seem to possess the character to a certain extent, while others lack it entirely . . . . . 8.

7. The fore-wing only with a pilose patch as above described. General colour of the insect testaceous brown, but the scutellum distinctly yellow . . . . . *polita*, Leach.

— Hind-wing with a pilose patch like that of the fore-wing but much smaller. General coloration of insect darker, scutellum not yellow but brown like the rest of the dorsal surface.
castanea, W. F. Kirby = *divaricata*, W. F. Kirby. ♂, *nec* ♀ ! †

Type of *divaricata* in B.M.

8. Two basal joints of antennae black, the rest testaceous. Abdomen black above, sulphur-yellow beneath. Scutellum testaceous (not yellow) with a more or less conspicuous central sulcation . . . . . *antiopa*, n. sp.

— All joints of antennae luteous (none black !) Dorsum of abdomen never black. (Scutellum may be *yellow*, or may differ from that of *antiopa* in its sculpture) . . . . . 9.

* Visible to the naked eye ! It is very desirable that these hairs should be examined in living specimens. They much resemble the so-called *androconia* of some ♂ Lepidoptera, and I venture to suggest that they may have a similar function. This point cannot be investigated to any purpose in old dried specimens. "Australian Entomologists, please note !" So far as I know, the existence of scent-scales in the wings has never yet been suspected in any Hymenopteron, though it is well known that certain ♂ Bees have a peculiar fragrance (*Psithyrus*, etc.).

† The ♂ and ♀ described together by W. F. Kirby (*Ann. and Mag. N.H.*, 1893, p. 39) as the sexes of a new species "*divaricata*" cannot possibly be conspecific, their neuration showing that they belong to different groups. *Divaricata* ♂ I take to be almost demonstrably the ♂ of *castanea* previously described from ♀ only by the same author; and *divaricata* ♀ is in my opinion a specimen of *bella* ♀ it certainly belongs to the *bella* group, as shown both by its neuration and its saw-characters !

Kirby (*l.c.*) says he was "at first inclined to refer these specimens to *P. castanea*, Kirb." He did not do so because "in that species the scutellum is much less thickly punctured."

9. Scutellum bright yellow, almost or quite impunctate and unsculptured . . . . . 10.
— Scutellum brown (or only obscurely yellow) with strongly punctured disc . . . . . 11.
10. Side lobes of mesonotum partly chalybeous . *schiödtei*, Westw.
— Side lobes of mesonotum entirely testaceous . *klugii*, West.
11. Puncturation of scutellum extremely dense and rugulose. *kirbii*, Leach.
— Puncturation of scutellum scattered and irregular. *agnata*, n. sp.
12. Abdomen above and below dark violaceous. Hind legs with femora tibiae (at extreme apex) and tarsi blackened. A small form—about 12 mm. long . . . *dahlbomii*, Westw.
— Abdomen for the most part testaceous above and below . 13.
13. Larger—about 17½ mm. long. Scutellum with its entire apical margin black. Abdomen with its intermediate dorsal segments feebly but rather broadly infuscated above, the infuscation looking somewhat metallic (greenish) in certain lights. *vollenhovii*, Westw.*

Type at Oxford.

— Smaller—10 to 15 mm. long. Scutellum entirely yellow, or with its apical lobes only darkened. (N.B.—In all ♂♂ of this group the scutellar lobes are almost obsolete.) Abdomen above after the propodeum either entirely testaceous or with very slight and interrupted indications of a darker central line. In some specimens (*dubia*, W. F. Kirby) the propodeum is yellowish, in others—as also in *vollenhovii*—it is black. All these colour differences are likely to be inconstant; and I can only at present recognise one variable species in the specimens before me . . . . . *brullei*, Westw. = *ritsemei*, Westw. = *dubia*, W. F. Kirby.

Types of *brullei* and *ritsemei* at Oxford. Type of *dubia* in B.M.

14. Antennae black; scutellum black except its yellow apex; abdomen above chalybeous, (a beautiful steel-blue !) beneath pale yellow. Hind tibiae with black apices. *guerinii*, Westw. = *sericea*, W. F. Kirby.

Type of *guerinii* at Oxford. Type of *sericea* in B.M.

* Two ♂♂ of this in B.M. were determined by W. F. Kirby as *brullei*, Westw. These specimens are from Queensland.

— Antennae scutellum and abdomen all testaceous. Hind tibiae without black apices . . . . . *ferruginea*, Leach = *newmanni*, Westw. = *sellata*, W. F. Kirby.

Type of *newmanni* at Oxford. Type of *sellata* in B.M. The Type of *ferruginea* (B.M.) is a ♀.

15. Antennae with only 5 joints completely * separated from the apical club. Labial palpi with only 3 joints, maxillary with only 4 . . . . . 16.
— Antennae with 6 joints completely * separated from the club. (Genus *Xyloperga*, Shipp = *Heptacola*, Konow). Labial palpi with 4 joints, maxillary with 6 . . . . . 18.
16. Larger—about 14 mm. long. Wings stained with yellow, their margins with a faint greyish-purple infuscation. Abdomen belted with bright red over its 2nd and 3rd segments, the following segments deep black.
gravenhorstii, Westw. = *peletieri*, Westw.

Type of *peletieri* at Oxford. The Type of *gravenhorstii* —also at Oxford—is a ♀.

— Smaller—about 11–12 mm. long. Wings and abdomen coloured otherwise . . . . . 17.
17. Abdomen blackish above, more or less rufescent near the articulations of its segments. At the sides and on the ventral plates it bears conspicuous whitish markings. Clypeus and labrum yellow. . . . *bella*, Newman = *foersteri*, Westw.

N.B. The clypeus, especially when viewed laterally, appears as though its apex ended on each side in a blunt, but distinctly projecting, tooth! (This is because the clypeus, before its apical margin which is slightly reflexed, is impressed deeply at its centre but not at its sides so that the corners are left standing up at a higher level than the rest.)

N.B.—Both fore- and hind-wings, as in *castanea*, are furnished with patches of scale-like hairs in the radial and cubital areas!

Type of *foersteri* at Oxford. (It is, I think, certainly the ♂ of *bella*, which was described from a ♀). There is another specimen quite like it in B.M.

* By "completely" I mean "all round." The club itself sometimes appears more or less *indented* laterally (as though jointed), but the indentation never runs completely round it!

— Abdomen almost entirely red, with no white markings at the sides or beneath. Clypeus black. A patch of scale-like hairs occurs in the fore-wings only.* Apex of clypeus simply rounded on each side, with no reflexed margin, nor appearance of dentiform corners . . . . . *lutreillii*, Leach.

Type in B.M.

18. Abdomen with its basal half mostly luteous, the apical segments only being chalybeous . . . *X. univittata*, W. F. Kirby.

Co-types in B.M. (The Type is a ♀.)

— Dorsum of abdomen practically chalybeous throughout . . 19.

19. Basal joints of antennae, hind femora, and apices of hind tibiae blackened . . . . . *X. lalage*, W. F. Kirby.

Type in B.M.

— Antennae and legs altogether testaceous or luteous . . . 20.

20. Vertex shining and almost impunctate. Middle lobe of mesonotum with a conspicuous V-shaped yellow mark defining its posterior (= basal) angle. The scutellum is not entirely yellow, its apical half being partly occupied by a subtriangular impressed space of darker (brownish) colour.

(The puncturation both of head and thorax in this species is much less close than in *jurinei* and the surface very much more shining.) . . . . . *X. amenaida*, W. F. Kirby.

Type in B.M.

— Middle lobe of mesonotum only touched with yellow at its extreme base (no conspicuous V-shaped mark !). Scutellum entirely yellow.

Puncturation of head and thorax dense and "granulose," the surface consequently appearing completely dull.

X. jurinei, Westw.

Type at Oxford.

The other described forms of *Xyloperga* are all ♀♀, mostly unique specimens at Oxford or in B.M., and their ♂♂ have yet to be discovered.

* This, at any rate, is the case with the Type; which, however, is of course a very old specimen, though it seems in fair condition.

CEREALCES, W. F. KIRBY.

SYNOPSIS OF THE SPECIES.

The genus *Cerealces* is known only from Australia. It contains two species only, both described by W. F. Kirby, and of each ♂♂ only have occurred. These may be separated as follows—

Scutellum rufo-fulvous; hind tibiae entirely pale yellowish-brown. Antennae 10-jointed, the joints except the two first and the last distinctly (but not paradoxically) dilated at their apices . . . . . *scutellata*, W. F. Kirby.

Type in B.M. "South Australia."

— Scutellum black (with only the tubercles at its apex yellow); hind tibiae with black apices. Antennae 11- or 12-jointed, the intermediate joints paradoxically expanded (cup-like) at their apices. (The antennae of the Type are now unfortunately lost!) . . . . *cyathiformis*, W. F. Kirby.

Type in B.M. No precise locality is given.

PHILOMASTIX, FROGGATT.

SYNOPSIS OF THE SPECIES.

Two species of *Philomastix* have been described, namely *macleayii*, Westw. (= *glaber*, Froggart), and *nancarrowi*, Froggatt; the latter, by some oversight, is not included in Konow's list in *Genera Insectorum*. Westwood, as I have elsewhere mentioned, mistakenly described *macleayii* as a *Perga*, but this error does not invalidate the *specific* name which he gave to it, and this therefore has priority as against that proposed by Froggatt.

The species are practically identical in colour, at any rate in the ♀♀ (I have seen no ♂♂ of *macleayii*). But they seem to differ considerably in size, *macleayii* being the larger species, and also apparently always in the number of antennal joints, as stated below. It is curious that, in *nancarrowi* at least, the ♂ antennae are shorter than the ♀, and yet have more joints! See Pl. XII, Figs. 5, 6.

Westwood's Type of *macleayii* is at Oxford. The Types of *nancarrowi* and *glaber* are, I suppose, in Australia,

and of course I have not seen them, but two specimens of "*glaber* ♀" and many of *nancarrowi* ♂♂ and ♀♀ are in B.M. named by the author.

♀♀.

Stigma with pale (yellowish) apex. Antennae more than 15-jointed in the ♀. Larger species.
macleayii, Westw. = *glaber*, Froggatt.

— Stigma entirely dark. Antennae only 13- or 14-jointed (the apical joints are not very distinctly separated) in the ♀. Smaller species . . . . . *nancarrowi*, Froggatt.

The very curious larva of *Philomastix* is figured in Froggatt's "Australian Insects." It has, like *Perga*, no ventral legs and, unlike that or any other Australian sawfly-larva, two paradoxically long anal appendages (*cerci* ?). In both these characters it seems allied to the *Pamphilidae*, but in these the cerci are comparatively quite short! I doubt, however, whether this similarity is due to any special phylogenetic affinity between the Australian and the Palaearctic species. The former is much more probably a peculiar genus of the *Pergidae*, with which it agrees in several characters (reduced number of palpi, etc.) not found in any of the *Pamphilidae*.

(For the alar neuration of *Philomastix* see Pl. XI, Fig. 13.)

PERGULA, n. g.

I have only seen one species of this curious little genus, and of that species only one specimen, a ♂. It is, however, so distinct that I venture to describe it.

Pergula turneri, n. sp. ♂.

Black, shining, feebly and shallowly punctured. Mouth-parts, trochanters, knees, tibiae, tarsi, and genitalia sordidly whitish. Apices of hind tibiae, and the tarsal joints following, more or less infuscated. Wings hyaline.

Antennae very shortly pilose, 7-jointed; the apical joint about as long as the two preceding it, and rather longer than joint 3. The joints, except the apical and the two short basal ones, are all obconical, and the antennae as a whole might be called subclavate. Face subquadrate, inner margins of eyes parallel. Clypeus very short (its apical margin slightly sinuated inwards), antennae inserted close above it. Frons deeply sulcate longitudinally from the

anterior ocellus to the clypeus, it is also sulcate on each side between the supra-antennal carinations and the compound eyes. Ocelli in a low broad triangle.

Fore-wings with the costa much dilated before the stigma, nearly filling up the intercostal area, the latter with no visible transverse nerve or longitudinal vein dividing it. Radial cell without a dividing nerve, and not appendiculate at its apex. Four cubital cells present, the 2nd and 3rd each receiving a recurrent nerve near its middle. Lanceolate cell wanting, as in *Perga*, etc. Hind-wings with one closed cell (cubital); humerus present. Tibiae without ante-apical spines, but with the hind calcaria extremely long—longer than the metatarsi.

Length about 4½ mm.

S. W. Australia, Yallingup (near Cape Naturaliste), taken by Mr. R. E. Turner in September or October 1913. Type in B.M.

PTERYGOPHORUS, KLUG.

SYNOPSIS OF THE SPECIES.

The first Sawfly to be described from Australia was a *Pterygophorus*, and the genus seems to be one of the most abundant in most parts of that region, and also one of the most striking both in colour and structure.

Its affinities are rather doubtful, but perhaps its nearest relative is the Brazilian genus called by Cameron *Lophyroides*, and by Konow (wrongly, I think) *Perreyia*. Konow associates it with the Northern group of which the best-known genus is that called by Jurine *Pteronus* (from its plume-like ♂ antennae) = *Diprion*, Schrank = *Lophyrus*, Auctt. But its neuration in both wings is so very different, that I think any relationship it may have to that group must be extremely remote!

Since its larva has ventral pro-legs, and its palpi have the normal number of joints (4 labial and 6 maxillary), it approaches more than *Perga*, etc., to the usual structure of the Sub-order. In fact, its only real abnormality seems to be in the matter of neuration, and in this it agrees with *Perga*, etc., except in the complete disappearance, or non-development, of a "second" cubital nerve in the fore-wing.

See Plate XII for figures of the antennae (♂ and ♀) in

certain species, and Pl. XI, Fig. 12) for the neuration of the wings.

♀♀.

1. Dorsum of abdomen, except its yellow apex, unicolorous—chalybeous or deep-black with no broad yellow or testaceous markings. (Group of *cyaneus*) . . . . . 9.
— Dorsum of abdomen entirely testaceous, or broadly banded with that colour or with yellow . . . . . 2.
2. Pronotum and scutellum concolorous with the mesonotum—chalybeous not testaceous nor yellow. Length of body seldom exceeds 10 mm. . . . . 3.
— Pronotum and part at least of the scutellum testaceous or yellow. Mostly large forms, 15 mm. long or more . . 4.
3. At least 5 consecutive segments of the abdomen are testaceous. Wings (Pl. XI, Fig. 12) for the most part clear hyaline, but distinctly clouded under the stigma—the clouding elongate, extending a little beyond the apex of the radial cell. Costa not concolorous with the subcosta but yellowish. Antennae (Pl. XII, Fig. 10) not simply *serrate* as in most ♀♀ of this genus, but evidently *pectinate* though more shortly so than those of the ♂♂. . . *analis*, Costa = *gaudialis*, Konow.
— Only four consecutive abdominal segments are testaceous. Wings more or less violaceo-fuscous throughout, but (as usual in this genus) somewhat more so in the upper part of the fore-wing. Costa and subcosta concolorous—fuscous. Antennae (Pl. XII, Fig. 9) simply serrate.
uniformis, W. F. Kirby.

Queensland (Mackay). Type in B.M.

4. About as large as *analis* and *uniformis*, smaller than the spp. following. Abdomen, except its extreme base and the apex of the saw-sheath, entirely testaceous. Middle lobe of mesonotum narrowly yellowish at the sides. Fore-wings (N.B.) bisected transversely by a conspicuous dusky stripe which runs from the stigma right down to the inferior margin. A similar but smaller clouding covers the upper basal nerve and fills the base of the wing, and the inferior margin is clouded likewise. (The antennae in the only B.M. specimen have only 12 joints, but this is probably exceptional. Brullé figures the antennae of his Type as 20-jointed.)
bifasciatus, Brullé.

N. S. Wales (Tweed River) B.M. Coll. Tasmania (*teste* Brullé).

— Larger, usually about 15 mm. long. Abdomen blackened at least at the sides, or widely before the apex. Middle lobe of mesonotum immaculate, entirely chalybeous. Fore-wings with elongate (not transverse) clouding . . . . . 5.

5. Abdomen above black or cyaneous at the sides only. Antennae entirely black. Stigma fuscous, costa testaceous. General colour rather brick-red than yellow or orange.

interruptus, Klug.

All eastern Australia and Tasmania.

— Abdomen above with at least three of the intermediate segments blackened right across. Costa and stigma yellow. General colour inclining more to yellow or orange than to red (group of *cinctus*) . . . . . 6.

6. Yellow banding of abdomen narrower, only one dorsal segment —the third—entirely yellow. Sixth segment black except narrowly at its apex. Seventh segment black . . . 7.

— Bands of abdomen broader, and the colour rather orange than yellow. At least the second and third segments and a part of the seventh are of this colour. The fourth segment is rarely entirely black, and when it is so the seventh segment is entirely flavous. Generally both these segments are partly black and partly yellow. (Whether these colour-differences are more than subspecific seems very doubtful!) . . 8.

7. Apex of clypeus widely and angularly (but very obtusely) emarginate . . . . . *cinctus*, Klug.

N. S. Wales (Woodford, etc.); Victoria; S. Queensland.

— Apex of clypeus in the unique specimen in B.M. truncate; otherwise exactly like *cinctus*, of which it is possibly only an individual aberration. (It is not a "subspecies," having been taken along with the typical form of *cinctus*!).

distinctus, Rohwer.

N. S. Wales (Woodford). Type in B.M.

8. Seventh dorsal segment of the abdomen, but not the fifth and part only of the fourth, for the most part yellow.

insignis, W. F. Kirby.

Only known from Queensland (Mackay). Type in B.M.

— Seventh dorsal segment black, fourth and fifth entirely yellow. I have only seen one specimen of this form, viz. Mr. Rohwer's

Type. The author compares it with *interruptus*, Klug, but it has little resemblance to that species and is evidently much nearer to *cinctus*. (I am inclined, as is also Mr. Turner, to regard all these forms (*distinctus*, *insignis*, and *zonalis*) as specifically not separable from *cinctus*: but more material is needed before the question can be positively decided).

zonalis, Rohwer.

Queensland (Mackay). Type in B.M.

9. Joints 3rd to 8th of the antennae pale yellow. Apex of clypeus not bilobate, but sinuated inwards very slightly through its whole extent. General colour deep-black with slightly metallic (greenish) reflections on the abdomen, purplish on the mesonotum, and brightly chalybeous on the face, except the clypeus which is greenish at the base and violaceous at the apex. Pronotum, scutellum and a very narrow (widely interrupted) fascia at the apex of the propodeum pale yellow. Wings yellowish, infuscated at their bases and in the radial and cubital areas . . . . . *turneri*, Rohwer.

Queensland (Cairns). Type in B.M.

— Antennae entirely black. Apex of clypeus bilobate . . . 10.

10. Basal half of fore-wings and the entire hind-wings nearly clear and colourless, apical half only of fore-wings distinctly clouded. Abdomen entirely chalybeous except its extreme apex, which is yellow . . . . . *cyaneus*, Leach *

= *leachii*, Konow, *nec* W. F. Kirby.

Victoria.

— Wings brownish-violaceous throughout, though darkest at their bases and in the radial and cubital areas. Colour of body as in *cyaneus* of which it is very probably a "subspecies."

leachii, W. F. Kirby, *nec* Konow.

Queensland (Bowen, Mackay, Townsville). Type in B.M.

♂♂.

1. Abdomen brick-red, with the apical ventral plate, the propodeum and the two following segments, and (N.B.) a spot on each side of segments 4th to 8th, chalybeous or violaceous-

* Leach does not mention the yellow apex of the abdomen, and Konow therefore distinguishes *cyaneus* from *leachii* as not having this character. But in fact the colour of the ♀ abdomen is identical in both forms, though in the ♂♂ it *does* differ as stated by Konow!

black. The pronotum, episternum of mesopleuron, scutellum, and postscutellum yellow. Antennae black, with a pectination of 20 rays. (The ♀ is unknown.) . *cygnus*, W. F. Kirby.

W. Australia (Swan River). Type in B.M.

— Abdomen differently coloured (especially without the lateral spots on the intermediate abdominal segments !) . . . 2.

2. Pronotum concolorous with the mesonotum—chalybeous . 3.

— Pronotum yellow, contrasting with the chalybeous mesonotum. 4.

3. Wings with a slight uniform brownish or violaceous infuscation throughout. Antennae longer than in the next species, with more numerous (about 20 !) but proportionately shorter rays. These are about equidistant from one another throughout, and grow shorter very gradually from the 10th joint onwards . . . . . *uniformis*, W. F. Kirby.

Queensland (Mackay).

— Wings clearer, almost colourless. Antennae shorter, with fewer (about 18) rays. These are closely packed together near the base, but towards the apex become more widely separated, and grow abruptly shorter from about the 14th joint onwards . . . . . *analis*, Costa.

Victoria.

4. Abdomen with a broad red basal belt. Wings colourless, unclouded. Antennae entirely black . . *interruptus*, Klug.

— Abdomen not belted with red. Antennae sometimes yellow, entirely or only at their bases . . . . . 5.

5. Abdomen belted with yellow . . . . . 6.

— Abdomen unicolorous, chalybeous or black . . . . . 7.

6. Fore-wings with a distinct elongate clouding along their upper margins. Yellow belting of abdomen sharply defined. *cinctus*, Klug, and (var. ?) *insignis*, W. F. Kirby.

— Fore-wings faintly brownish with no distinct marginal clouding. Yellow markings of abdomen somewhat vague and indefinite. *leachii*, W. F. Kirby.

7. Antennae with black bases. Wings coloured as in *leachii*, but with a distinct small clouding under the stigma. Abdomen chalybeous and shining. . . . . *cyaneus*, Leach.

— Antennae with yellow bases. Wings yellowish as in the ♀, but without conspicuous clouding. Abdomen black and dull. *turneri*, Rohwer.

The ♂ of *bifasciatus* is unknown.

DIPHAMORPHOS, ROHWER.

SYNOPSIS OF THE SPECIES.

Of this genus two species only are known; they were both introduced and described in detail by Mr. Rohwer, in *Entomological News*, vol. xxi, p. 474 (December 1910).

The ♀♀ differ conspicuously both in size and colour as follows—

♀♀.

— Larger, length about 6 mm. Head, thorax, and abdomen black without red markings . . . . *nigrescens*, Rohw.

Victoria. Type in B.M.

— Smaller, length about 4 mm. Head and thorax black, but abdomen with a broad red belt covering at least four consecutive segments. (These ♀♀ superficially resemble small ♂♂ of *Clarissa divergens*, but are naturally broader in proportion to their length, and the antennae (Pl. XII, Fig. 11) have more joints, and taper more towards their apices.)

minor, Rohwer.

North Queensland. Type in B.M.

♂♂.

The ♂ of *nigrescens* is unknown. That of *minor* differs from the ♀ in having the abdomen entirely black, and also, in such specimens as I have examined, in having 16-jointed antennae. these in the ♀ seem to be always 15-jointed.

EURYS, NEWMAN.

SYNOPSIS OF THE SPECIES.

Eurys and the genera most allied to it have been supposed to be distinguishable among themselves by differences in the number of joints in their antennae. But even in the very limited material before me I find these differences far from constant. Generally no doubt the number of these joints in *Eurys*—or at any rate in its ♀♀—is 9. But in one of the three ♀ specimens of *E. lactus* in B.M. the number is 10. It is 10 also in a specimen which Mr. Rohwer has ticketed as the "Type ♂" of his n. sp. *deceptus*, and in one of two others marked by him as "paratypes"

of the same. Solely, it would seem, on account of this character the species *inconspicuus*, Kirby, which in size and colour is utterly unlike a normal *Eurys* and has also a difference in its neuration, has been placed in this genus. But here, too, a ♂ in B.M. has distinctly not 9 joints, but 10. (I have little doubt myself that this species is no *Eurys*, but a *Clarissa*, and shall treat it accordingly !).

Again, *Euryopsis*, Kirby, is said to have 11-jointed antennae, and this is true of the only two specimens (both ♂♂) on which this supposed "genus" has been founded. But I am almost sure * that these specimens are really the hitherto unidentified ♂♂ of two *Eurys* species of which ♀♀ only have been described. "*Euryopsis nitens*," W. F. Kirby, I take to be almost certainly the ♂ of *Eurys laetus*, and "*Euryopsis bella*," Rohw., most probably the ♂ of *Eurys nitidus*. The number of joints in *Clarissa* spp. varies even more. Of *divergens*, W. F. Kirby, I have seen specimens with 10, 11, 12, and 13 joints respectively, and in the Type (at Oxford) of *C. thoracica*, n. sp. the number of joints is 14. *Neoeurys*, Rohwer, is said by the author to be easily known by its 14-jointed antennae, but in the Type of *E. metallica* the number of the joints is 15. And in a ♂ of another species from Mount Wellington, Tasmania, it is 11 only !

Thus in the comparatively few specimens before me the number of antennal joints in *Eurys* (as I should define that genus) varies from 9 to 11, in *Clarissa* from 9 (or 10 if *inconspicuus* be not included) to 14, and in *Neoeurys* from 11 to 15. Such a fluctuating character is practically useless for determination of specimens, and even if it were more constant, I should hesitate to consider it of really generic value.

On other characters, however, the three groups of species, though closely allied, seem capable of being maintained as at least good subgenera, and perhaps as good genera, though on the existing material I should not myself have ventured to erect them as such. Thus

Eurys (including *Euryopsis*) differs from *Clarissa* in the brilliant metallic coloration of all its species, and also in having the radial cell more distinctly appendiculated, in consequence of which its apex is not adjacent to the margin of the wing. The same character separates it

* If I am mistaken in this, no ♂♂ at all of Eurys have been described !

also from *Neoeurys*, with which it agrees in coloration. And *Neoeurys* is also a smaller and much more slender form, with evidently more elongate joints in its antennae, and also in its legs—the hind tarsi (in particular) being far longer in proportion to the tibiae.

The four forms actually known to me which I should unhesitatingly refer to *Eurys* may be tabulated as follows—

♀♀.

1. Abdomen entirely metallic, without yellow or whitish markings at the sides or beneath . . . . . 2.
— Abdomen with the inflexed sides of its dorsal plates margined at their posterior corners with white or yellow . . . . 3.
2. Head, thorax, and abdomen metallic green or greenish-blue throughout, with slight golden, fiery, or cupreous reflections in certain lights. Femora not blackened at their bases above but entirely testaceous-orange, concolorous with the tibiae and tarsi. Length about 7 mm. . . *laetus*, Westw.

Type (described as a "*Dictynna*") at Oxford.

— Head and thorax reddish-cupreous throughout, densely punctured and therefore somewhat opaque; the abdomen is distinctly greener, with little if any cupreous tint. Femora evidently infuscated at their bases above. Rather smaller than *laetus*—about 6 mm. long.
rutilans, n. sp. (= *aeratus*, W. F. Kirby! *nec* Newman?)

W. F. Kirby called this specimen "*aeratus*, Newm.," but it does not correspond at all well to Newman's description, which particularly states that the head and also the thorax are "nigro-aeneous." *Aeratus* was described in 1841 from two specimens in the Collection of the Entomological Club. That Collection was presented a year later to B.M., so the Types ought to be there now. But if they ever arrived there, they have long disappeared, for no mention of them is made in Kirby's List. (The present specimen is certainly not one of the missing Types, having been acquired at a much later date by purchase.) On the whole I see no reason for identifying this form with *aeratus*, Newm., and provisionally treat it as distinct.

Type in B.M.

3. The largest and most highly coloured of the forms. Length about 8 mm. Head and thorax finely and rather closely

punctured. Abdomen greenish at base and apex, but the intermediate segments above are mostly rich purple, diversified with bluish, indigo, and green reflections in certain lights. Beneath, the lateral white or rather pale yellow markings are conspicuous and well defined, contrasting strongly with the green surface of the ventral plates which they overlap. The legs are testaceous or luteous with the apices of the hind tibiae, and the tarsi more or less blackened.

nitidus, W. F. Kirby.

Type in B.M.

Considerably smaller than *nitidus*. The white markings of the abdomen are not so well developed, and its dorsum is nearly unicolorous (metallic blue- (or sage-) green, and darker than the thorax, which is brassy, sparsely punctured, and very shining). The tibiae and tarsi are immaculate.

deceptus, Rohwer.

Type in B.M.

(In all these insects the labrum is more or less white, the head and thorax delicately punctured, and the abdomen has a very fine and close transverse striation. Without more material it is impossible to be sure which of their differences are really of specific value.)

NEOEURYS, ROHWER.

SYNOPSIS OF THE SPECIES.

In the original description of genus *Neoeurys* it was said to be readily separated from its allies by the 14-jointed antennae, but I have found variations in the number of antennal joints in all genera of this group. And, in fact, the Type of *metallica* in B.M. (a ♀) has the antennae 15-jointed, while in a ♂ of another species the number of joints is only 11.

The characters which seem to me best to distinguish this genus from *Eurys*, with which alone it is likely to be confused are: (1) the much shorter and broader face, and (2) the more elongate joints of the hind-legs, particularly the tarsi, which appear to be quite as long as the tibiae, whereas in *Eurys* they are evidently shorter. It differs also from *Eurys* as stated in my Synopsis of Genera

(*supra*) in having the apex of the radial cell close to the margin of the wing, and no definite appendicular cell beyond it.

The B.M. collection contains at present 7 specimens of *Neocurys*, viz. (1) a ♀ (the Type) of *metallica*, Rohwer, (2–4) a ♂ and two ♀♀ taken by Mr. A. M. Lea on the summit of Mount Wellington, Tasmania, (5–6) two ♂♂ taken by Mr. Turner on the same mountain, but not near its summit (these are considerably smaller than Mr. Lea's ♂, and I doubt if they belong to the same species, and (7) a ♂ also taken by Mr. Turner at Eaglehawk Neck—a very different locality from the summit of Mount Wellington, namely a low-lying sandy isthmus on the coast of Tasmania. (It does not appear to me identical with the specimens from Mount Wellington, but on such material as I have yet seen it appears safest to reserve judgment.)

I thought at first that Mr. Lea's captures were sure to be identical with Mr. Rohwer's n. sp. *tasmanica*, of which the ♀ was taken apparently with them (cf. *Ann. and Mag. N. H.*, November, 1918). But I am now rather doubtful, because Mr. Rohwer does not mention the most obvious, though perhaps not most important, character, of the B.M. ♀ specimens—namely, the non-metallic pale reddish-testaceous apex of the abdomen. If this character is not constant, the B.M. ♀♀ are probably *tasmanica*: and the ♂ accompanying them, though larger than the male assigned to them by Mr. Rohwer (which was taken at Eaglehawk Neck, and is no doubt identical with Mr. Turner's ♂ from the same locality) unquestionably belongs to them. Not having seen Mr. Rohwer's Types, which are still in America, I cannot clear up the matter; but provisionally I will assume that his *tasmanica* ♀ is a different species from Mr. Lea's captures now in B.M., and propose in that case to call the latter *Neocurys caudata*, n. sp.

The ♀♀ of *metallica* and *caudata* differ much in coloration, as follows—

— Head, thorax, and abdomen concolorous, reddish cupreous. The apex of the abdomen not differently coloured.
metallica, Rohw.

— Thorax and abdomen except its apex not at all reddish, but black with a slight greenish (aeneous) tinge. The apex of the abdomen not at all metallic, but pale testaceous.
caudata, n. sp.

In the ♂ of *caudata*, which is very nearly as large as the ♀ (about 4 mm.) the abdomen is unicolorous, blackish from base to apex, the antennae 11-jointed.

The other ♂♂ had better, I think, remain undetermined in the absence of any ♀♀ with which they seem likely to be associated. It will probably be found that several species (or at least subspecies) exist in Tasmania and elsewhere. The Type of *metallica* is not from Tasmania, but from Victoria.

CLARISSA, NEWMAN.

SYNOPSIS OF THE SPECIES.

Though the relationship between *Clarissa* and *Eurys* is evidently very close, they differ so markedly—at least in the few species of each yet known to me—in the matter of coloration, that it is easy to distinguish them at sight. In *Eurys* this coloration is thoroughly metallic—as much so as in many of the *Chrysididae*, whereas in *Clarissa* it requires close examination to discover any tendency to metallescence. The present metropolis of *Eurys* seems to be West Australia, while that of *Clarissa* seems to be rather North Queensland, and the only locality I can name where both genera have yet occurred is the neighbourhood of Adelaide. Striking as is this difference in colour, it is perhaps of no very essential importance, for in many Hymenopterous and other genera metallic and also non-metallic species occur in the same regions. Still, as they differ (though slightly) in neuration, and on an average in the number of antennal joints, the distinction between them may provisionally be treated as generic: yet it would not be surprising, if the discovery of intermediate forms should lead to a uniting of them at some future time. But setting aside this possibility, which it is really useless to suggest while so few of the imagines and none of the larvae, etc., of either genus have been described, I will proceed to a tabulation of such material as lies before me.

♀♀.

1. Abdomen with no part testaceous, either black with white markings, or black entirely . . . . . 2.
— Abdomen red except at its (black) apex . . . . . 3.
2. Thorax black; a large whitish mark on each side of the 2nd

abdominal segment. Apex of clypeus, labrum, etc., trochanters, and part of the tibiae whitish, the rest of the body and legs black. Length of body about 7 mm.

atrata, G. Turner.

N. Queensland. Type in B.M.

— Thorax red; abdomen entirely black; apex of clypeus, labrum, and legs luteous or testaceous—the tibiae and posterior tarsi widely blackened. Wings rather cloudy, their neuration and the stigma brown. The antennae of the unique Type are 14-jointed. . . . . *thoracica*, n. sp.

"Australia" (*teste* Westwood). Type at Oxford.

3. Thorax above entirely testaceous. Antennae usually more than 10-jointed, but the number varies (10 to 13). Abdomen testaceous with black apex. Length of body about 7 mm.

divergens, W. F. Kirby.

N. Queensland (Cairns and Mackay). Type in B.M.

— Prothorax red, but mesonotum almost entirely black. Antennae usually 9-jointed, but sometimes 10-jointed. Abdomen coloured like that of *divergens*. Much smaller than any other species of *Clarissa* or *Eurys*, the largest ♀♀ not above 4 mm. in length. . . . . *inconspicuus*, W. F. Kirby (described as an *Eurys*).

N. Queensland, also Adelaide. Type in B.M.

♂♂.

I do not know the ♂ of *thoracica*. Those of the three other species are coloured very similarly, black with testaceous antennae and legs, and with the intermediate dorsal segments of the abdomen more or less rufescent. *Inconspicua* can be recognised at once by its tiny size, barely 3 mm. long. In *divergens* the abdomen has a broad red belt occupying at least the whole of segments 2 and 3 and often extending to segment 4. In *atrata* these segments have their *apices only* red, but their *bases* black. Both in *divergens* and *atrata* the antennae, and parts of the legs (the femora and the apices of the tibiae and tarsi) are somewhat infuscated; in *inconspicua* this is not so. All the ♂♂ are slightly shorter and considerably less broad-bodied than their ♀♀, and the prothorax in all of them is entirely black.

Note 1.—*On the Distribution of Sawflies in general: the three Zoological "Realms": and the probable origin of the Australian Sawflies.*

In this Note, and several of those which follow it, I propose to avail myself on occasion of certain terms which have been employed by Lydekker in his valuable and suggestive little book *A Geographical History of Mammals* (Cambridge Geographical Series, 1896). The principal land areas of the Earth are there divided into three chief zoological "Realms," namely, ARCTOGAEA (= North Land), NOTOGAEA (= South Land), and NEOGAEA (= New Land), and the two first of these "Realms" are further divided into areas called "Regions." Though originally founded on the Distributions of past and present *Vertebrate* groups, especially Birds and Mammals, and entirely without regard to that of Insects, these divisions seem applicable also to the *present* Distributions of Sawflies. Of their *former* Distributions we know, unfortunately, next to nothing. Such fossil remains of the Sub-order as have yet been described, are too few, too imperfect, and of far too recent date, to throw any considerable light upon the subject.

For our present purpose the limits of the three great "Realms" will be sufficiently defined by saying that "Neogaea" is nearly coextensive with such parts of America as lie south of the Tropic of Cancer; "Arctogaea," besides including the rest of America, extends across the Bering Straits and occupies all Europe, Asia and Africa with their adjacent islands, except so much of the Malayan Archipelago as lies east of "Wallace's Line"; while "Notogaea" consists primarily of Australia and Tasmania, which form a "Region" by themselves, but is also reckoned as embracing three other isolated Regions, namely, (1) the "Austro-Malayan" islands (especially New Guinea), (2) Hawaii (the Sandwich Islands) and (3) "Polynesia" (New Zealand, etc.). Hawaii and Polynesia, however, may here be left out of account, for the former (as I learn from Mr. Muir) has no indigenous Sawflies at all, and, with one doubtful exception, the same is the case with Polynesia. The Sawflies of New Guinea, Celebes, etc., are very little known as yet, but some of them appear to be related to Australian forms, though not actually identical with them.

Not much need be said here as to most of the "Regions" included in Arctogaea. The largest and by far the most

important is the "Holarctic," which includes the greater part of North America, all Europe, and the parts of Asia and Africa adjacent to the Mediterranean Sea, Siberia, N. China, Japan, and Central Asia. The parts of Asia nearest to and north of Australia (India, South China, Sumatra, Borneo, etc.) are the "Oriental Region." South Arabia and South and Central Africa make up the "Ethiopian Region." Madagascar is the centre of an isolated Region of its own. And the "Sonoran Region" separates—or, rather, bridges over the interval which separates—Neogaea from Holarctic America. The word "Holarctic" will occur frequently in this Note, but the other Regions will seldom have to be mentioned. I know their Sawflies only from Museum specimens, but if the inferences suggested by these can be trusted, the differences between Holarctic forms and those occupying other Arctogaeic Regions are not very striking and *negative* rather than positive: *i. e.* the latter are characterised chiefly by the *absence* or extreme rarity of groups which are dominant in the North, and the places of these are filled not by other groups peculiar to the Region, but by a further differentiation and increase of certain particular genera which are well represented in the Holarctic Region also. In Africa, for instance, and perhaps throughout the Ethiopian Region, forms identical, or nearly identical, with Holarctic *Arge* and *Athalia* spp. seem in a manner to have made themselves paramount. (*Pachylota*, Westw., originally described as from "S. Africa," would be a singular exception to the general rule, if we did not know that this genus was really Neogaeic.) In the number of well-differentiated "high" divisions (Families, Subfamilies, etc.) included in—and often confined to—it, the Holarctic Sawfly-Fauna far exceeds that of all the other Regions taken together, and from this it is natural to infer that the Sub-order has been longest established there, and that somewhere in this Region was probably the original centre of its distributions, the Sawflies of the other Regions being really descendants of such Holarctic genera as have overflowed into them and succeeded in adapting themselves to the new surroundings. Any genus which could not do this would remain, of course, confined to its original habitat, or extend only in certain limited directions—chiefly eastwards or westwards, such movements involving no change of climate, etc.

But if, after comparing the Sawflies of various Arctogaeic

Regions with one another, we proceed to compare them as a whole with those of Notogaea, it becomes at once apparent that we are dealing with far more substantial differences. The line of demarcation between the two groups is almost as distinct as that which separates the Mammals of the two Realms. We find, indeed, one single Siricid (a *Xiphydria*) belonging to a genus which is represented by species not very dissimilar in the Oriental Region, and by other species of slightly different appearance (longer ovipositor, etc.!) in Europe, and even in England! We find also one true *Sirex* (manifestly imported, for the natural range of this genus is exclusively Holarctic). And we find, also, that one very common and mischievous Sawfly, whose slimy slug-like larva is a notorious pest in European and American orchards has reached, evidently by unintentional and quite recent importation, both Australia and New Zealand. We find lastly one small insect which, though I believe it to be generically distinct from anything in Arctogaea, has so many characters in common with a well-known Arctogaeic genus, that it was referred to it by the late W. F. Kirby and described as "HYLOTOMA" *apicale*, n. sp. But otherwise, so far as I know, Australia and Arctogaea have not a single really native species, nor genus, perhaps not even one "Tribe" of Sawflies in common. It is not till we reach the higher category of "Subfamilies" (according to Konow's classification in *Genera Insectorum*, etc.) that the Faunas of the two Realms begin to show connection. Finding this we are naturally reminded—though I do not mean to say that the cases are precisely parallel—of the fundamental dissimilarity between the present Mammalian Faunas of Australia and Arctogaea. Apart from Bats, which in all such questions must be left out of account—it is well known that not only have these lands no native Mammals in common, but that they differ even as to the "Orders" represented in them, the Mammals of Arctogaea (except one American Opossum, which has spread northwards out of Neogaea) being exclusively Eutherian, while those which are unquestionably native * (*i. e.* not importations) in Australia are never Eutherian, but either Marsupials or Monotremes.

There is, in fact—"*si parva licet componere magnis*"—a really curious and interesting parallelism in many respects

* Neither the "Dingo" nor the Australian *Muridae* are "unquestionably" natives.

between the distributions throughout the world of Mammals on the one hand, and Sawflies on the other. Thus (*a*) outside Australia (the N. American Opossum above-mentioned excepted) Marsupials occur in Neogaea only, and there also only we find Sawflies possessing certain characters otherwise confined absolutely to Australian forms (no "lanceolate cell," labial and maxillary palpi with a reduced number of joints), and agreeing with them also in general "facies" and coloration; (*b*) it is well known that the indigenous Faunas of Oceanic islands include no Mammals except Bats, and the same appears to be the case with Sawflies, except the Timber-boring forms, which, like Bats, have special possibilities of distribution; (*c*) the Faunas of Madagascar and Arctogaea have at present, I believe, only two Mammalian genera in common, and I can only find one record of any Sawfly genus occurring in both, viz. *Athalia*, except which no Sawflies at all are known to occur in Madagascar, and Mr. H. Scott tells me there are none in the Seychelles; (*d*) a few groups only of Mammals (e. g. *Canidae* and *Felidae*) have a practically world-wide distribution extending in one case to Australia; and similarly among Sawflies one remarkable group (the *Arginae*) is thoroughly cosmopolitan and has certainly reached Australia. This may perhaps be the case with a few others (*Lophyrinae*? and *Cimbicinae*?), but a majority probably, both of Mammals and Sawflies, have their ranges strictly confined between certain parallels of latitude, and this applies not only to species but to genera, Tribes and Subfamilies; (*e*) lastly, though certain groups both of Mammals and Sawflies have reached their maximum of abundance and differentiation in other Regions, it is pretty clear that the real metropolis and original centre of distribution of Sawflies must have been Holarctic, as was certainly that of Mammals. Practically all the primary divisions of the Sub-order (and of *Hymenoptera* generally) are well represented there, and one at least (*Lydidae*, Konow = *Megalodontoidea*, Rohwer) —as well as many flourishing Subfamilies, Tribes, and genera of others—is apparently quite confined to that Region. Therefore, though we have no palaeontological evidence whatever as to the former habitats of existing Sawflies or their ancestors, such as abounds in the case of Mammals, it seems highly probable that the present representatives of both groups, in any particular district, have arrived in their present habitats from not very

different centres of distribution by similar routes, helped or hindered from time to time by similar causes. For whatever physical barriers—such as seas, rivers, mountains running east and west, deserts, intolerable climates and temperatures, absence of certain kinds of vegetation, etc., etc.—would present unsurmountable obstacles to the migrations of a rather feeble and sluggish herbivorous Mammal, would also restrict the distributions of most genera of Sawflies; and, on the contrary, in both cases such circumstances as sudden complete and long-continued isolation in a favourable district through the disappearance of land-bridges by which they had entered it would tend to the rapid multiplication and differentiation into new forms of some few stocks in that particular district, while everywhere else they might be extinguished by the competition with them of their superiors. Thus it is, perhaps, not to be wondered at that Australia should have a Fauna consisting, alike as to its Mammals and its Sawflies, of genera and species apparently well-differentiated and fairly flourishing, but representing a very small and probably not the most characteristic part of—not the *present* Oriental Fauna, but the Fauna which occupied that Region before Notogaea ceased to be in contact with it!

Nor, when we reflect on the long ages that have elapsed since that contact finally ceased, and the multitude of forms that must have since been developed or become extinct on both sides of Wallace's Line, will it surprise us that the present Australian Sawflies should no more resemble those of the Oriental Region than those of any other part of the world, or that the forms most resembling them should happen to survive only in a country so distant as Neogaea. Nearly the same has been the case with the Mammals. And we may, perhaps, regard the phenomenon as somewhat parallel, though on a much larger scale, to that of a country peopled throughout almost its whole extent by certain dominant races, but with a few dwindling remnants of tribes which had failed to hold their own in the interior lingering on still, at points very far apart, in adjacent islands, or headlands on its coasts. Alike in Australia and in South America the southward migrations of Sawflies appear to have reached their extreme limits; * the vegeta-

* I have sought in vain for any record of Sawflies from Patagonia or South Chile. Darwin's collections made there and now in B.M. include not one of that group!

tion and climates of certain parts in both are known to have something in common, and may be alike adapted to the occupation of somewhat similar groups. The Aculeate Family of *Thynnidae* is, I believe, also limited to these two Realms.

To judge from the evidence of Distribution—and we have really no other evidence to go by—it is hardly conceivable that the Sawflies of Australia can have arrived there otherwise than from Arctogaea, by way of the Oriental Region, and travelling entirely overland. Even if, in very ancient periods, "land-bridges" or "belts" may have connected Neogaea and Notogaea by way of Africa, or Oceania, or an extension of the Antarctic Continent, we do not know that at that time any Sawflies existed at all, nor do any of the districts through which they would have passed contain now, so far as is known, any evidence whatever of such migrations. Africa is the only one of them in which at present any *Tenthredinidae* are normally to be found, and not a single African Tenthredinid has the least appearance of special affinity to Notogaeic or Neogaeic forms: it is hardly too much to say that from Algeria and Egypt to the Cape the whole "facies" of every species and genus indicates a comparatively speaking not very ancient Holarctic origin! Again, much as the present Arctogaeic Sawflies differ in certain respects from those of Notogaea and Neogaea, there is so much essential agreement in the general structure and instincts of the whole Sub-order, that it is impossible to doubt that all must have radiated out from one original centre of distribution: and it is most unlikely (taking all facts into consideration) that such centre was anywhere but in Arctogaea. All that is most strange and exceptional in the characters of Notogaeic and Neogaeic Sawflies can be probably accounted for by their long separation from their Holarctic relatives, during which separation they have lived under different conditions, and no doubt undergone, in consequence, quite different modifications of structure, instincts, etc., in successive generations: and, as might be expected, the Notogaeic Sawflies are, on the whole, much more abnormal than those of Neogaea, the former only having been *completely* isolated since Tertiary times.

Although I have ventured to express the above opinions with some confidence, I must admit that they rest mainly on circumstantial and not altogether satisfactory evidence.

The Sawflies of very few Regions have been collected and studied to any considerable extent, and the known species of any other are probably a very small fraction of those actually existing there. This is especially true of South America, except a few particular districts, and also of the Oriental Region. For instance, up to December 1911 only *eight* species representing *seven* genera of Sawflies (including the *Siricidae*) had been recorded from Java; and then, all at once, the captures made by a single Dutch collector in one visit to the island *doubled* the number of its known genera and brought that of its known species up to *twenty*. It is also a significant fact that this collector's captures included only one species that had been recorded from Java before! (*vide* Enslin in *Tijdsch. v. Ent.* LV. 1912, p. 104). I have already alluded to another difficulty in dealing with our present subject, namely, the want of any palaeontological evidence as to the former range of any particular group. Without such evidence, as has been remarked by Lydekker, many facts as to the present distribution of Mammals would have been incapable of explanation. And it seems only too probable that for lack of it many of the points on which I have ventured to speculate must always remain unsettled.

Note 2.—On Sawflies in general. The Characteristics of the Sub-order, and the Groups included in it.

The Sawflies, if that word be used in its widest sense, are a primary division (Sub-order) of the Order *Hymenoptera* distinguishable from all its other Sub-orders by at least two very definite and obvious differences, one in the structure of the imago, and another in that of the larva. In neither case has this difference been *developed within the Sub-order itself*. What has really happened, on the contrary, is that, whereas all the imagines of other Hymenopterous groups have *developed* a character unknown in any other Order, and all their larvae have *lost* a character which seems to have been formerly universal in the Class *Insecta*, the Sawflies, both as imagines and as larvae, have remained true to the original type. A similar primitiveness, or *conservatism*, may be noticed in other characters of the Sub-order, especially in the venation of their wings, which as compared with that of all other Hymenoptera is remarkably "generalised." There is, on the whole, much more uni-

formity and simplicity in their instincts and habits than is found in other groups; they form no communities, nor, so far as is certainly known, does "inquilinism" or "commensalism" of any kind occur among them. We have, perhaps, scarcely such evidence as would justify a positive assertion that they are actually the oldest existing branch of the Hymenopterous family-tree, but I can point to nothing either in their structures or in their life-histories which would render this view improbable.

(*a*) The imaginal character which most definitely distinguishes the Sawflies from all other Hymenopterous Sub-orders is the absence of any "constriction" at the point where the so-called "thorax" joins the abdominal segments which follow it. But this so-called thorax in the *Hymenoptera* includes, besides the three truly thoracic segments, a fourth (the "propodeum") which has become more or less incorporated with them during pupation, having originally formed part of the abdomen. And it is really not between the thorax and the abdomen, but between this segment and the rest of the abdomen that the constriction is situated. Accordingly, it might be correct to include this segment always when counting the number of abdominal segments, and in the case of the Sawflies it is not unusual to do so. But in dealing with other Sub-orders most authors commence their enumerations *after* the constriction, so that what is really the 2nd abdominal tergite is called the 1st, and so on. Since this remarkable constriction (which enables Wasps, Bees, Ichneumons, etc., etc., to turn and twist in all directions the segments following it, and thus bring their "stings" to bear on any part they please of any creature attacked by them) is a character peculiar to *Hymenoptera* and not developed in insects generally, its entire absence in the Sawflies * is clearly a

* Konow's name for the Sub-order, which is adopted in Rohwer's Classification (1911), viz. *Chalastogastra*, meaning, I suppose, (*Hymenoptera*) "*with unconstricted abdomen*," seems to describe the real state of things more exactly than Lepeletier's *Sessiliventres* and other names that have been suggested (e. g. *Symphyta* as opposed to *Apocrita*), which imply that the *thorax and abdomen* are fused together. This, so far as the basal segment of the abdomen (= *propodeum*) is concerned, is the case with *all* Hymenoptera! Another name, employed in some other Papers of Rohwer, and of Enslin is *Tenthredinoidea*, but for philological and other reasons I have a special dislike to names formed after that pattern, and prefer to accept *Chalastogastra*.

case of "generalisation" and suggestive of antiquity in the group.

The larvae of all other *Hymenoptera* are footless, but those of the Sawflies invariably possess three pairs of visible *thoracic* legs—even in such cases as that of the *Siricidae*, where these legs are feebly developed and probably quite useless. Here, again, the Sawflies' structure appears to be more primitive, though the Hymenoptera are not the only group in which the thorax of the larva bears no legs. Also in the largest and most typical subdivision of Sawflies most of the abdominal segments are furnished with processes serving as legs ("pro-legs") much like those of Lepidopterous "caterpillars." Opinions differ as to the origin of this character. Some have thought that the ancestors of all insects possessed abdominal legs which have now disappeared in all imagines and most larvae, though they have survived in larvae of these two Orders, but Handlirsch seems more likely to be right in holding that in neither case have they been inherited from any primitive common ancestors, and that such resemblance as exists between the larval pro-legs of Lepidoptera and those of certain Sawflies is merely "analogous," and consequent on the similar habits and surroundings of the organisms. Although a great majority of Sawfly larvae possess them, these all belong to one only of several distinct Families or "Superfamilies," into which most recent specialists divide the Sub-order. Larvae which at all times live and feed concealed in wood (*Sirex*, *Oryssus*, etc.), or in buds, stems, reeds, stalks of cereals, etc. (*Cephus*, etc.), or wrapped up in rolled leaves, or silken webs (*Pamphilius*, etc.), never have pro-legs, having, in fact, no need for them, as we shall see presently.

(*b*) The character from which the "Sawflies" receive their vernacular name in English (and also in French, sc. *Mouches-à-scie*) is the *serration* or *denticulation* of a part of their ovipositing organs, namely, the two bilaterally symmetrical blades, placed side by side, and sliding freely backwards or forwards along a supporting "backpiece"—this also consisting of two bilaterally symmetrical parts, not, however, freely movable, but bound together at least at their bases, so that they must move together when they move at all—with which they form receptacles for their eggs. These blades have often a really striking resemblance to saws, and a part at least of their operations may

fairly be described as "sawing." But there are two objections at least to considering this as the *essential* distinction between this and the other Sub-orders. In the first place *all* Hymenoptera (the Aculeates, Ichneumons, etc., included) have their ovipositors so far saw-like that their apices are armed with teeth, and are used for making their way through the substances (whether animal or vegetable) on which they are operating very much as a saw makes its way through *wood*, etc., chiefly by help of its denticulations. And, secondly, it is only in certain Sawflies that the organ has really a *saw-like appearance*, with fairly broad blades, and denticulations elsewhere than at the apex. In many cases it is rather lancet-like than saw-like, scarcely to be distinguished from the "sting" of a Wasp or an Ichneumon, and in *Oryssus*, etc., it is practically identical with the terebra of a Cynipid. It may be added, that in all cases, whatever be the general appearance of the organ, all its parts are absolutely homologous—the sliding toothed cutting-blades, their more or less connate "supports," the attachments to the apical ventral segments, the complicated arrangements by which the "saws" are started and guided in their movements, etc., etc. The purpose for which their operations are undertaken (namely, to prepare a suitable "larder" or "refectory," which will provide an unfailing supply of food for the expected offspring) is identical, whether the insect be a Sawfly, or a Cynipid, or even an Ichneumonid, or a Fossor,* for food is food, whether it be animal or vegetable! On the whole, then, it is the *post-basal constriction of the abdomen*, rather than any character of the ovipositor, which really distinguishes other Hymenopterous Sub-orders from the Sawflies.

There are, however, a good many other characters which, at least in the order *Hymenoptera*, are exhibited by Sawflies only; but most of these (e. g. *two* calcaria instead of *one only*—on the front tibiae) are not found in all groups of the Sub-order. Always, however, their wings have a greater number of veins.† and this should also indicate "general-

* It seems to be only in the *Social Aculeates* that the organ is chiefly used for other purposes, as a *weapon* rather than a *tool*, to some extent merely for self-defence, but more for protection of the community (by repelling enemies, extirpating its useless members, etc., etc.).

† Except in *Oryssidae* where the alar venation seems "degraded." And even these have the "lanceolate cell," which is peculiar to Sawflies!

isation," though it may be remarked that the wings of extinct (fossil) Sawflies seem to lack certain veins which are well developed in such living forms as come nearest to them, and that long-isolated groups sometimes (as, for instance, in Australia) have a distinctly *less* complete neuration than that which prevails in Arctogaeic forms. We shall presently see that certain veins are always wanting in Australian genera, which are either invariably, or at least generally, present in non-Australian Sawflies, and this and other facts seem at first sight to conflict with the view that, when a vein usually present is absent in certain cases, it existed in them formerly, but has since been lost. I will reserve this subject, however, till I come to deal in another Note with the special peculiarities of Australian Sawflies.

Hitherto I have throughout been using the word "Sawflies" in its widest sense, including under it the two Linnean "genera"—or, as most authors would now call them, "Families"—*Sirex* and *Tenthredo*.* But it is often also applied (with or without deliberate intention) to the latter only, and in America—but not, I think, in England—vernacular names have also been proposed for the former. Comstock, *e.g.*, in his well-known *Manual* (10th edition, 1912) distinguishes "Tenthredinidae, *Sawflies*," from "Siricidae, *Horn-tails*," and Rohwer (1911) writes on the "*Genotypes of Sawflies and Wood-wasps*," etc. In Germany (from Panzer, Schrank, Christ, etc., onwards) many authors have called them respectively "*Blattwespen*" and "*Holzwespen*" (= *Leaf-wasps* and *Wood-wasps*), but I doubt if in this country we shall ever bring ourselves to call a stingless insect a *wasp!* To an English reader the name *Wood-wasp* would rather suggest a Hornet (or perhaps a "*Vespa sylvestris*") or some such creature as a *Pemphredon* or a wood-boring *Crabronid*.

But to proceed: whatever names we are to substitute for *Tenthredo* and *Sirex* as originally distinguished by Linné (and for the moment I shall follow Comstock in calling them respectively *Tenthredinidae* and *Siricidae*), the differences between the two groups are very important, and suggest a

* The "Law of Priority" as at present interpreted has made it necessary to restrict both these names to a few only of the species originally included in them, and unfortunately both of them have been restricted to different groups by different authors. However, as none of these groups contain any Australian species, except the (imported) *Sirex*, or "*Paururus*," or "*Urocerus*," *juvencus*, no more need be said here on this subject.

number of questions which I have found very interesting even when I have failed in answering them to my own satisfaction. Let us inquire, then, how the typical members of these sections differ—first, as to their Bionomics (= the life-history of the individuals in each group), and afterwards in other ways, some of the latter differences being apparently consequent on the former.

(*a*) The food of their larvae differs, though in both cases alike it consists exclusively of vegetable tissues. The typical *Siricidae* feed on *timber* of some sort, perhaps never quite sound and sometimes actually rotten; the *Tenthredinidae* on fresh *leaves*, which in some cases are devoured entirely, in others merely skeletonised, or more or less emptied of their "parenchyma."

(*b*) The special mark of the *Tenthredinidae*, however, is not so much the precise nature of their food—for leaves are also eaten by certain genera (*Pamphilius*, etc.) which in other respects differ considerably from any typical Tenthredinid—as the circumstances that (i) they are able to *move freely* about the substances on which they are feeding, and that (ii) while thus moving about they are usually *fully exposed to view*, or at most imperfectly screened by the semi-transparent cuticle of a leaf within whose interior they are feeding. Larvae of *Siricidae*, on the contrary, issuing from eggs deposited at the bottom of a deep and extremely narrow hole in the interior of timber, find themselves hemmed in on all sides by material through which they can only pass by gnawing a tunnel out of it with their jaws, and afterwards forcing themselves forwards into this tunnel, so as to continue the operation, with the help (as it is believed) of a sort of horny spike, which arms the other (anal) extremity of their body. Continuing this progress, which must, of course, be slow and practically always in one direction, they gradually pass by a tunnel which grows wider and wider as they themselves increase in size from the interior of the timber towards the world outside; but do not actually emerge into it till they have completed their metamorphoses and are no longer larvae but imagines. Accordingly, (i) their movements are not free, but severely limited, and (ii) they are under cover, and indeed buried in absolute darkness, during the whole of their larval life.

(*c*) Evidently connected with these differences in the bionomics of the two groups are certain other differences -

namely of structure and general appearance—exhibited almost without exception in their larvae.

(i) The free movements of Tenthredinid larvae are greatly assisted by their possession of well-developed thoracic legs, jointed, and armed with claws, and also of "abdominal pro-legs" more or less like those of Lepidopterous caterpillars, not indeed so elaborately constructed, but generally more numerous (six pairs at least, and most commonly eight). So far as is yet known, it is a rule to which, outside Australia, there are no exceptions, that whenever the larva of a Saw-fly feeds on leaves openly and moving freely about them, it possesses abdominal pro-legs. On the other hand, such pro-legs never occur among the *Siricidae*, and even their thoracic legs are ill developed and jointless. Nor are pro-legs developed in *Pamphilius*, etc. (whose larvae feed on leaves, but keep always under cover, spinning silken webs or rolling about themselves (like Tortricids) cases formed from portions of the leaves on which they are feeding; nor, again, in the *Cephidae* which feed not actually *in wood*, but as a rule *out of sight*, in buds, berries, corn-stalks, hollow or pithy stems, reeds, etc., and appear to be, both in habits and structure, at least as nearly related to the *Siricidae* as to the normal *Tenthredinidae*.*

(ii) The open life of a Tenthredinid larva exposes it to many accidents and attacks of enemies, against which a Siricid is to a great extent protected by its surroundings. Hence in the former group many self-protective instincts and "characters" have been developed, which would be useless and are unknown among the *Siricidae*. Such, for instance, are habits of dropping out of sight when alarmed; lurking *under* a leaf, when not actually feeding; emission of nauseous odours and secretions; assumption of "threatening attitudes," etc. Many species again have developed protective colorations, cryptic or aposematic, etc., etc. Nothing of the kind, naturally, is to be found among the *Siricidae*. It is probable that their larvae have no instincts but such as are common to all insects at that stage (feeding, moulting, preparing in due course to pupate, and so forth); and, like most animals which live absolutely in the dark,

* In one or two (non-Australian) genera, which on the whole must be reckoned as *Tenthredinidae* (*Phyllotoma*, *Kaliosysphinga*, etc.) the pro-legs are ill developed, though never perhaps entirely wanting. But these are leaf-miners—*internal feeders*—and therefore no exceptions to the rule as stated above!

they are practically colourless, and would gain no immunity from any dangers by "mimicry," etc., or formidable appearance, or disguises of any kind. Against the only enemies likely to assail them (Ichneumonids, carnivorous beetles, centipedes, etc.) they are protected to a great extent by their surroundings; and if these fail to save them, they can only succumb. Disguises assumed in the midst of darkness would not help them, and they cannot take refuge by leaving their burrows.

(iii) Siricid larvae, with one doubtful exception, are said to be always eyeless; whereas those of *Tenthredinidae* have invariably a single pair of ocelli, one on each side of the head. The connection of this difference with their different modes of life is so obvious that it needs no comment. But it may be added, that in the *Cephidae* eyes are not wanting, though they *are* said to be very small. In *Pamphilius*, etc., they are present and well-developed; and as these, though feeding under cover, do not live in actual darkness, we have every reason to suppose that eyes are useful to them.

(*d*) The different bionomics of the two groups have a certain effect on the structure not of their larvae only, but of their imagines. In order that a Siricid egg may be introduced into such surroundings as will suit the larvae which is to issue from it, the ovipositor of the ♀ parent must be of considerable length. Its function being simply to pierce, any unnecessary breadth or thickness would render it less serviceable, and yet it must be armed (at least near its apex) with something in the nature of saw-teeth that it may make its way through a certain amount of resistance in the material to be penetrated. Accordingly the terebra of a ♀ Siricid is long—sometimes paradoxically long!—and narrow; its paired blades are shaped like fine needles which have been more or less flattened to give them cutting edges; and these cutting edges have a few minute denticulations just before their apices. (In the *Orussidae* the whole apparatus is so phenomenally slender that it might almost be mistaken for a long fine hair!) Even in those cases where it is shortest—as, for instance, in *Derecyrta*, *Brachyxiphus* and certain spp. (chiefly Oriental) of *Xiphydria*—it still projects to a considerable distance beyond the dorsal apex of the abdomen, and, even when at rest, cannot (as in *Tenthredinidae* and also in Bees, Wasps, etc.) be drawn backwards completely out of sight. A certain amount of protection, however, is usually given to it by a modification

in the form of the last dorsal segment. This is constricted laterally and drawn out into a kind of spine which overhangs the base of the terebra, and is often jagged at the sides in a manner which suggests that it may play some part in the operations of the latter. (In the *Orgssidae*, however, the last dorsal segment is simple, but in these the terebra, though actually longer than the abdomen, is so slender and elastic, that it can be bent back at its base, and packed away out of sight in the abdomen itself. This Family, as several authors have remarked, seems to be a link between the *Chalastogastra* and other Hymenopterous groups, especially, I would suggest, the *Cynipidae*.)

The ovipositions of the *Tenthredinidae* are made quite otherwise. Here the eggs are to be so placed that the free-moving larvae may pass at once after hatching to the leaves which will form their food. There would be no gain, but the contrary, if the eggs should be sunk any more deeply into the food-plant than suffices to keep them in position till the larvae emerge from them. They are deposited accordingly, never at any great depth, in a sort of slit or pouch formed by the terebra of the ♀ parent between the transparent cuticle of a leaf (or stem) and the tissues underlying it. The terebra best adapted for cutting out such a receptacle need not be particularly long, and extreme slenderness would be actually undesirable. As a matter of fact, the form of the pouch, and the manner of its formation varies considerably in different cases, and though the "saws" of all *Tenthredinidae* have a certain family-likeness they differ exceedingly in details for reasons which have yet to be discovered. But, at any rate, they are always much broader and thicker in proportion to their length than those of any Siricid, armed with many more denticulations, and altogether departing much more from what seems likely to have been the primitive type of an ovipositor. They seldom extend beyond the apex of the abdomen, and are never too long to be completely sheathed, when not in use, within the modified last ventral segments. The dorsal segments seem to be little if at all affected as to their shape and size by their vicinity to the ovipositor. Occasionally they are slightly compressed laterally in the anal direction, but never so as to form an actual spike, and they may usually be described as simple.

We have now seen (1) that to a certain extent the different manner of oviposition in the two groups seems to be actually

necessitated by the different requirements of their larvae in the matter of food; (2) that in each case it determines in part the surroundings, and consequently the habits and even the structures of the larvae, and (3) that it requires in each case a different modification in the terebra of the ♀ parent, and of the abdominal segments to which the terebra is attached. It appears also to have another consequence, namely, that it affects the possible distributions of genera and species in the two groups.

A Siricid larva may be and often is conveyed alive and unhurt from one Region or even Realm to another, under circumstances which would make such transportation practically impossible in the case of a Tenthredinid. Very rarely indeed certain species of the latter group have passed into and become established in a new district otherwise than by their normal methods of dispersal, carried unintentionally by human agency over barriers which they could never otherwise have surmounted, *e. g.* across sea-straits, and even oceans. Whenever this is known to have happened, it is generally known that their food-plant was transported also.* And it seems almost impossible that such transportation should be successful unless the transported insect happened at the time to have "spun up" or "gone down" for pupation. Neither the exposed larva nor the imago would be likely to survive a violent disturbance of all its normal surroundings, and the life of the latter is

* In illustration of this two cases may be cited. (*a*) The Nematid *Pteronidea tibialis*—an American species—occurs quite commonly in Europe feeding on *Robinia pseudacacia*, a tree belonging to an exclusively American group. This tree was introduced for the sake of its timber on a very large scale by the celebrated William Cobbett. (He sold 40,000 specimens to the then Lord Folkestone for planting, cf. his *Rural Rides*.) Within a few years it became distributed far and wide, and now abounds in all Western Europe. Not long afterwards the insect made its first appearance in England, and was described as *tibialis*, n. sp. by Newman. Subsequently, in the same year, Hartig recorded it (under another name) as *hortensis*, n. sp. from Germany.

(*b*) The only Tenthredinid common to New Zealand and Australia, or to either of these regions and any other, is *Caliroa limacina*, Retz. Though described from New Zealand as a new indigenous species under the name *Monostegia antipoda*, W. F. Kirby, it is undoubtedly the mischievous species whose ugly slimy larva has been a nuisance to all fruit-growers for at least a century and a half, both in Europe and North America, and there can be no doubt whatever that it has reached Australia through the importation of Holarctic fruit-trees.

under any circumstances exceedingly short. On the other hand, *Siricidae* are constantly imported, as larvae (in timber) over great distances on shipboard, or by rail, etc., and when the transportation involves no great change of climate they often become established in the new habitat, nor is it necessary that material for their future ovipositions should accompany them, for such is sure to be found wherever they may go. This, no doubt, helps to explain why the range of some *Siricidae* is practically world-wide, even when they cannot be said to be abundant anywhere, and why the distribution of others is so extraordinarily "discontinuous," whereas that of *Tenthredinidae*, whether their range be wide or otherwise, is almost always strictly "continuous." At the same time there are probably reasons why the *normal* dispersals also of *Siricidae* should be less restricted than those of *Tenthredinidae*. The imago of the latter is commonly a soft-bodied, feeble, and rather clumsy and awkward insect, timid and inert, incapable of bearing rough usage, and disinclined to change its quarters without necessity—in fact, its whole life is often passed on or near the plant, on whose leaves it had fed as a larva. Its wings, though ample, lack rigidity, and are usually far less well adapted to prolonged flights than those of a Siricid, even if it had instincts prompting it to undertake them. The mere fact that its migrations would generally be only from one leaf to another of the same plant, or from one plant to another of the same sort growing hard by, would naturally make its dispersal slower than that of a Siricid, for the ♀♀ of that group seem not unfrequently to oviposit at a considerable distance from the timber out of which they have emerged. They seem, too, altogether better adapted for rambling afield than most *Tenthredinidae*. Their bodies are harder, their wings stronger, and their speed, strength, and often somewhat formidable appearance may carry them safely over areas which it would be dangerous for a Tenthredinid to enter. It may be remarked also that the *Siricidae* whose distributions are most "discontinuous," belong to a group (*Oryssus*, *Ophrynopus*, etc.) whose species are rarities everywhere, and may probably be approaching extinction. It is still represented by at least one or two species in all Regions, and there can be little doubt that it was once a flourishing Family. Most of its characters appear to be exceedingly primitive, those of the ovipositor, etc., being remarkably "generalised"; others, however—

as the defective neuration of its wings—are suggestive rather of "degradation." On the whole, it seems likely that this is one of the oldest, and perhaps the very oldest, of all groups included in the Sub-order, and the discontinuity of its distributions may simply be due to its extinction in the intervening areas. Yet it is certainly very puzzling, and to my mind even inexplicable, that *Ophrynopus* should occur only in Notogaea and Neogaea, and should be represented in these very distant Regions by forms which can only just be distinguished specifically, unless we suppose that some unknown cause has interfered with its natural dispersal. I believe, too, that one of the two recorded European spp. of *Oryssus* (*unicolor*, Latr.) is really an American form; and Enslin has lately described another sp., closely allied to the only other European sp. (*Abietinus*, Scop.), from a most unexpected locality—viz. the interior of Africa!

For the two-fold division of the Sub-order adopted by Linné, later systematists generally substitute one which recognises either three "Families" (Konow) or four "Families" (Enslin) or four "Superfamilies" (Rohwer). The two latter authors agree in separating the *Oryssidae* from the *Siricidae*, whereas Konow kept them together. These two groups differ greatly in the structural characters of the imago, but the larvae of *Oryssidae* seem to be entirely unknown, and though we may be sure that they live enclosed like *Siricidae* in timber it has never been ascertained whether or no they feed on it. For certain reasons it has sometimes occurred to me that they may be parasitical, and I find from Rohwer's *Studies* of this group (1912) that the same idea has suggested itself to others. If, however, their structure and habits should prove to be identical with those of Siricid larvae, I incline to think that the agreement between the two groups would outweigh their differences, and at any rate that these differences ought not to be treated as equivalent to those which separate both alike from the *Tenthredinidae*. It might be well, perhaps, to leave this question open for the present, until Oryssid larvae have been discovered, and their structures and life-histories elucidated.

The chief point on which systematists now differ is as to the place which should be given in classifications to two groups whose habits and structure seem to be hardly those of either true *Siricidae* or true *Tenthredinidae*—namely,

the "*Lydini*" and "*Cephini*" of Konow. To explain the points at issue we may begin by recapitulating briefly the most conspicuous peculiarities of these groups. I have alluded to most of them already.

The imagines of *Cephini*, superficially at least, much more nearly resemble *Siricidae* than *Tenthredinidae*. They agree with the former also in having *one* calcar only on the front tibiae, whereas the *Lydini* and the *Tenthredinidae* have *two*. Their ovipositors are much shorter than in most *Siricidae*, but of a somewhat similar type; narrow throughout, with comparatively few and simple denticulations shaped like those in the "stings" of Bees and Wasps; and they are generally more or less exserted. Their hind tibiae in most genera are armed (besides the calcaria) with other spines before their apices. In this they agree with the *Lydini*, but differ from *Siricidae* and also from most *Tenthredinidae*, though certain genera of these latter (chiefly Notogaeic and Neogaeic) possess such spines. Their larvae, like those of *Siricidae*, have no abdominal pro-legs, but, unlike them, they have a pair of small and simple eyes. These characters taken together would suggest that they were nearer to *Siricidae* than to *Tenthredinidae*, and might be an aberrant group of the former. Many authors, in fact, have so treated them.

The imagines of *Lydini*, on the contrary, have hardly any resemblance to those of *Siricidae*; but superficially, and also in a character of some importance (front tibia with *two* calcaria), come much nearer to the *Tenthredinidae*. A detail of structure, however, in the thorax which they share with the *Cephini*, distinguishes them from the *Tenthredinidae*. But it also separates them from the normal *Siricidae*. Their ovipositors are small and little developed in any way, but more like those of *Tenthredinidae* than of *Siricidae*. Their tibiae are more copiously spined than those of any other group, and this especially distinguishes them from any normal *Siricidae*. Enslin, calling attention to their bi-calcarate front tibiae, tabulates them as *Tenthredinidae*, but treats the *Cephini* as a Family apart (*Cephidae*, Ensl.), though he remarks on their likeness to *Siricidae*. Konow, however, and also Rohwer, form one Family, or (as Rohwer calls it) Superfamily (*Lydidae*, Konow = *Megalodontoidea*, Rohwer) out of the *Lydini* and *Cephini*. I thought at one time that Enslin was certainly wrong in associating the *Lydini* with the *Tenthredinidae*, because the

whole structure and bionomics of their larvae differ profoundly. Larvae of *Lydini* have no abdominal pro-legs, they have a most singular and characteristic development of certain anal appendages (cerci), in both which characters they seem more "primitive" than normal *Tenthredinidae*: and though they feed *on leaves*, they are all the time *concealed* in rolled leaves or silken webs, one such web being sometimes spun in concert by a whole brood of larvae feeding together gregariously. But my confidence on the point was shaken when I found that several Australian larvae, which seem to be Tenthredinid, possess no pro-legs; that one of these (*Philomastix*) has also anal cerci developed even more paradoxically than those of the *Lydini*; and that the larvae of a certain Neogaeic Tenthredinid (*Dielocerus*) are stated by Curtis to spin up gregariously in a sort of joint-cocoon (*Tr. Linn. Soc. Lond.*, 1844, p. 218). The imagines of the Australian species above mentioned have ante-apical tibial spines as well as the usual "calcaria"; and putting all these facts together, I am tempted to think that both these latter and the *Lydini* may have inherited these characters from primitive Tenthredinid ancestors who had not yet completely developed the structures and habits, which have now become almost universal in the Family. At present, therefore, I cannot bring myself to follow Konow and Rohwer in uniting the *Cephini* with the *Lydini* as a single Family or Superfamily apart from and on a level with the *Siricidae* or *Tenthredinidae*. It seems to me more probable that the *Oryssidae*, *Siricidae* and *Cephidae* are subdivisions of one main group from which the *Tenthredinidae* should certainly be excluded. The *Lydini* (= *Pamphilinae*, Ensl.) may perhaps represent a primitive group of *Tenthredinidae* which had branched off from the main stock before it had developed certain characters (especially abdominal pro-legs in the larva, and the manner of feeding connected therewith) which are now almost universal in it —a few species, all Australian, being the only known exceptions. But even if this be true, it must remain a mere hypothesis in the absence of palaeontological evidences to support it, and such evidences must be admitted to be wholly wanting. Such little knowledge as we possess of the earliest representatives of the Sub-order has been carefully gathered and summarised in Handlirsch's great work on Fossil Insects. But the results at most indicate—it cannot be said that they *prove*—that the *Siricidae* are a more

ancient group than the *Tenthredinidae*. The former are represented in Secondary (Jurassic) strata by several forms which are referred to an extinct genus, *Pseudosirex*, and by a single very peculiar fossil, originally, but (*teste* Handlirsch) wrongly, described as an Ichneumonid (*Ephialtites*). If this be really a Sawfly it must, I suggest, have been an *Oryssid*. No *Tenthredinidae* or *Pamphilinae* occur in these strata, and no Sawflies of any kind have been found in those of Cretaceous or Eocene times. It is not till after the earliest division of the Tertiary period that *Tenthredinidae* and *Pamphilinae* begin to appear, namely, in the *Oligocene* deposits, and as most of these fossil forms are stated (sometimes, perhaps, in error?) to belong to well-known existing genera, they cannot be relied upon as fixing a date before which these groups cannot have come into existence. It is quite likely that they were already well established in Eocene times at least, and perhaps in Cretacean, or even earlier, for *Siricidae* certainly must have existed all through these periods though we have no records of them, any more than of the *Tenthredinidae!* What is the precise relationship between these great groups can as yet be only conjectured. Judging from their "characters"—and we have nothing else to judge by—we may suppose that the *Siricidae* are the earlier group, but whether the *Tenthredinidae* and *Lydini* had Siricid ancestors, or whether *Siricidae* + *Cephini* + *Oryssidae* and *Tenthredinidae* + *Lydini* are respectively earlier and later branches of a common stock are questions which must here be left unanswered. Of one thing we may reasonably feel sure, viz. that the earliest Tenthredinid and Lydine genera were not differentiated exactly as are those which now exist, and that therefore those representatives of them that have been described from Oligocene deposits are not the first generations of these Families. The original ancestors may yet be discovered in earlier strata, or may never be discovered at all.

Note 3.—Characters of Australian and non-Australian Sawflies compared or contrasted.

If, as I believe is the case, the Sawflies of Australia are all descended from Holarctic ancestors, it is natural enough that we should be able to recognise among them far fewer distinct and strongly characterised groups, than in many Holarctic regions of an extent equal, or inferior, to that of

Australia. For they can include no forms but such as have succeeded in maintaining themselves while passing gradually southwards through climates and surroundings which differed at every stage in the journey, and as have found everywhere a vegetation suitable for their oviposition, and held their own against a continual succession of fresh competitors and enemies of all kinds. And even among such Holarctic forms as possess this more or less exceptional adaptability, so that they now extend into districts lying as far south as Notogaea, probably a few only had reached the parts of Asia adjacent to Australia when the latter became inaccessible by its isolation. Had that isolation been a little longer delayed, Australia might probably have received from Arctogaea both Sawflies (e. g. *Athalia* and *Stromboceros*) and Mammals (e. g. *Tapirus* and *Elephas*) which seem never to have actually reached it. It is also not surprising that the type of Sawfly ("TENTHREDO *antennis filiformibus : articulis* 7–9" of Linné) which is most dominant of all in Holarctic districts—no doubt because it is best adapted to their special surroundings—should be precisely that which is most conspicuously absent from Notogaea, or, at any rate, from Australia. Whereas groups which have a more cosmopolitan range (*Arginae*, *Lophyrinae*, and *Cimbicinae*) though not unrepresented in Arctogaea form comparatively a very small part * of its Fauna.

I will now enumerate some of the most definite ways in which Australian forms differ often or always from the most normal Arctogaeic Sawflies. Not all the characters to which attention will be called are invariable in Australia or Arctogaea as the case may be; but some really are so, when we take them one by one; and others are *combined* together in one Realm in a way to which we cannot find parallels in the other. Considered as a whole they help to show, what has already been shown often and perhaps more conclusively by other kinds of evidence, (1) that the Fauna of Australia is as *distinct* as we should expect it to be from its long isolation, (2) that it includes representatives of only a few of the groups occurring elsewhere, (3) and that, however the fact is to be explained, there is more appearance of affinity between certain Neogaeic and Noto-

* A rough calculation, based chiefly on localities cited by Konow in *Genera Insectorum*, gives us in Arctogaea 4 *Arginae* only out of nearly 100 genera peculiar to it, in Neogaea 16 out of 33, and in Notogaea 3 out of 15.

gaeic forms than between the latter and any now to be found in Arctogaea.

As to "larval" characters, we have seen that occasionally in Australia, but never in Arctogaea, forms which feed moving freely about over their food-plants have notwithstanding developed no pro-legs. It would be interesting to know whether any such cases occur in Neogaea, and especially if there are any among such genera as in other ways seem to show affinity with *Perga*, etc. But I have sought in vain to get any information on this point, so we may pass on at once to consider the characters of imagines.

(a) *Venation of the fore-wing.*

i. In most groups of Arctogaeic Sawflies, and in almost all those which may be considered typical and dominant in that Realm, the radial cell is divided by a transverse nerve. The exceptions are the *Arginae*, the *Lophyrinae*, and a great majority of the *Nematinae*.

On the contrary in Notogaeic forms, to whatever group they may belong, the radial cell is invariably undivided. In some cases this is not surprising, for three of the Australian genera are *Arginae*, and others appear to be more akin to that group and probably also to the *Lophyrinae* than to any Arctogaeic genus in which the radial cell is divided. But we cannot thus account for the absence of a transverse nerve in the *Syzygoniides* (*Perga*, etc.). The only existing Arctogaeic Family in which these could possibly be placed is that of the *Cimbicinae*, and all Arctogaeic genera of that Family have the radial cell divided. Such at least is now the case though it is not easy to explain why it should be so, for the earlier (fossil) genera of *Cimbicinae*—the *Phenacopergini* of Rohwer's Classification—are stated to have the cell undivided, so that—contrary to what might have been expected—the venation of modern *Cimbex*, *Abia*, *Amasis*, etc. seems to be more "generalised" than that of their probable ancestors. But it is possible, no doubt, that the *Syzygoniids* and *Phenacopergini* represent one branch of the *Cimbicinae* in which the "transverse radial nerve" long ago disappeared, and the Arctogaeic *Cimbicinae* another branch of the same stock which have retained it. However, in any case, the universal absence of this nerve in Notogaeic *Tenthredinidae* is a circumstance which deserves to be noted.

ii. A character which separates all Arctogaeic Sawflies from Hymenoptera of other Orders is the presence of a

"lanceolate cell." The vein which bounds this "cell" inferiorly, called by Konow the "humerus," and by Comstock reckoned as a branch (or branches) of the "anal vein," is subject to much modification. It may be visible as running without a break from end to end of the lanceolate cell, and keeping entirely clear of the so-called "*brachius*" * (sic! in Konow's nomenclature) which bounds that cell from above. Or it may seem that these veins are in part combined into a single vein, with the result that the lanceolate cell becomes either "longly contracted," or "petiolate." But in no case is a lanceolate cell actually wanting.

But in several Australian genera, belonging to at least two or three distinct groups, no lanceolate cell whatever can be recognised. And of the genera which possess such a cell, one only—viz. *Zenarge*, Rohwer—has the cell shaped as in the most typical Arctogaeic genera (*Dolerus*, *Allantus*, *Tenthredella*, etc., etc. In all the others which belong to the *Arginae* it is "contracted," and in all which are not *Arginae* it is "petiolate." Here again, we find an agreement between the Notogaeic and Neogaeic Faunas. For, in Neogaea also, the lanceolate cell is wanting in several groups, and when present, is generally either petiolate, or contracted. And here, again, the facts seem rather puzzling. For the latest authorities on such subjects assure us that the venation of Hymenoptera becomes "specialised" by Reduction (i. e. *loss* of veins) only! And from this it would seem to follow that in this case the present Arctogaeic Sawflies, which have all retained the "vena humeralis," are more "generalised" and primitive than *Perga*, *Syzygonia*, and the other genera which have lost it. Yet, if this and the other abnormal characters of the latter were inherited from very ancient common ancestors—and this seems more likely than that they should have been differentiated independently and yet identically in some half-dozen different genera in two very distant Regions, and in no genus at all anywhere else—it is rather surprising that those ancestors should have had a venation *less* "generalised" and primitive than that now universal in Arctogaea.

* Who invented this word I do not know. The nearest approach to it I can find in Lewis and Short's Latin Dictionary is the *neuter* substantive "*bracchium*" (less correctly "*brāchium*") with an adjective "*bracchialis*" formed from it.

(b) *Venation of the hind-wing.*—In most Arctogaeic genera a "cubital" and also a "recurrent" nerve are present in the hind-wing, and the former lies *beyond* the latter (*i. e.* approaches nearer to the apex of the wing), so that two "enclosed cells" appear, of which the upper one is larger than the lower. More rarely the recurrent nerve only is present; and in some cases *both* nerves are wanting, so that the wing has no enclosed cells at all.

In Australia all indigenous genera except two out of its three *Arginae*, viz. *Trichorhachus* and *Antargidium*, have the cubital nerve present, and the recurrent absent—the one state of things which, if I mistake not, is never to be found in Arctogaeic forms. And both *Trichorhachus* and *Antargidium* differ from very nearly all Arctogaeic genera, even from their nearest relations among the *Arginae*, in that, though a cubital and a recurrent nerve are present, the former never lies beyond the latter, but (*vice versa*) the recurrent nerve in *Trichorhachus* lies far beyond the cubital, making the upper of the two "cells" by far the smaller!, while in *Antargidium* the two nerves are practically interstitial, and the "cells" are approximately equal. I had almost said that *no* Arctogaeic genus had a similar venation, but I should have been wrong, for *one* has it, viz. *Athalia*! There, too, the nerves are interstitial, and the two cells approximately equal. Of the Neogaeic genera *Syzygonia* and *Incalia* only seem to have a Notogaeic type of neuration in the hind-wing. In other cases *two* closed cells are regularly present, and these have the shapes and proportions usual in Arctogaeic forms.

(c) *Antennae.*—The type of antenna which is beyond all comparison the most usual in Arctogaeic Sawflies—namely, *nine* nearly simple cylindrical joints, generally tapering slightly from the base to the apex, none of them showing any very noticeable tendency to swell out or project at its apex and so give the antenna a "serrate," "moniliate," or "pectinate" appearance—seems to be entirely unrepresented in Australia. Instead, we find there all the Tenthredinid genera furnished with antennae more or less resembling those of some or other Arctogaeic, but not *specially* Arctogaeic, group. *Zenarge* and *Antargidium* have them much as in *Arge*; *Trichorhachus* as in *Schizocera*; *Perga* and *Xyloperga* as in *Cimbex* or more often as in *Abia*; *Pterygophorus* and *Polyclonus* as in certain *Lophyrinae*; and both sexes of several genera as

in ♀♀ (not ♂♂) of the latter group. Nine, instead of being the normal number of their joints, is about the rarest of all; almost confined to one genus, *Eurys*, and even there by no means universal, while the form of the joints is never simply cylindrical.

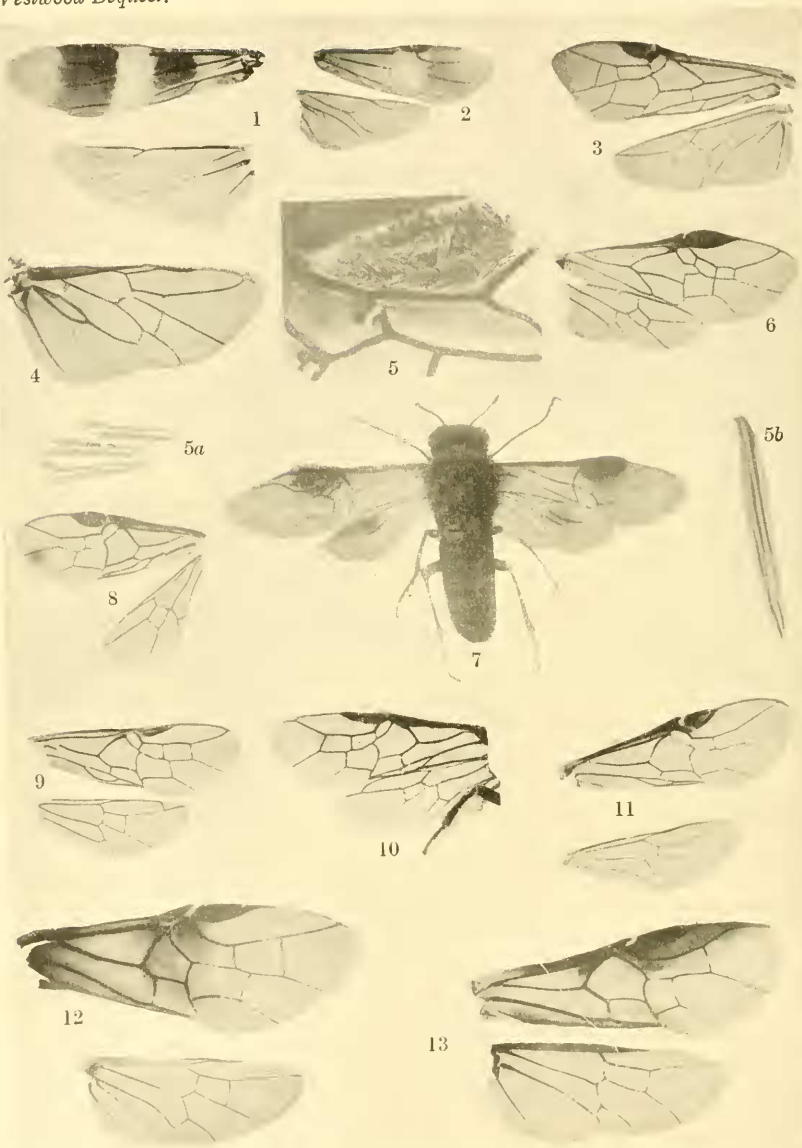
The most characteristic of the Neogaeic Genera resemble one or other of the Australian groups in their antennal characters. But genera also occur there which seem to have arrived more recently, either identical with present Arctogaeic groups or very closely related to them, and in these the antennae are of the prevailing Arctogaeic Type.

(d) *Mouth-parts. The palpi.*—Having examined dissections of the mouth-parts in many Arctogaeic *Tenthredinidae* I have invariably found that the maxillary palpi had 6 joints and the labial 4. The same numbers are normal in other Hymenopterous groups, though there are exceptions, *e.g.* the Bees.

But this rule is by no means so universal either in Notogaea or Neogaea. Citing only cases where I have myself examined the dissections, I can testify that in the Australian genera *Phylacteophaga*, *Philomastix* and *Perga* —not, however, in *Xyloperga*—and in the Neogaeic *Incalia* (*hirticornis*), *Pachylosticta* (= *Plagiocera*) *albiventris*, and *Lophyroides* (= *Perreyia*, Auctt. *nec?* Brullé) *tropicus* the numbers of joints are not 6 and 4 respectively, but 4 and 3. Again in *Syzygonia* they are 5 and 3, and in what I take to be the real *Perreyia*, Brullé, actually only 2 (or possibly 3) and 1.

There is no doubt that two or more quite unrelated groups might independently undergo a similar modification of their mouth-parts, and again that groups very nearly related might differ in this character, through adaptation to some special circumstance connected with their feeding. (Mr. Turner has thus explained a difference in the development of their palpi between the American and Australian *Thynnidae*.)

But it seems highly improbable that the agreement in so unusual a character between certain particular groups in two very distant districts, these groups having also a singular affinity in other quite different characters, should be a mere coincidence, the American and Australian forms having (as Cameron suggests) developed the reduction in the number of these joints independently since they reached their present habitats. I should suspect rather



Photo, F. D. Morice. *André, Sleigh & Anglo, Ltd.*

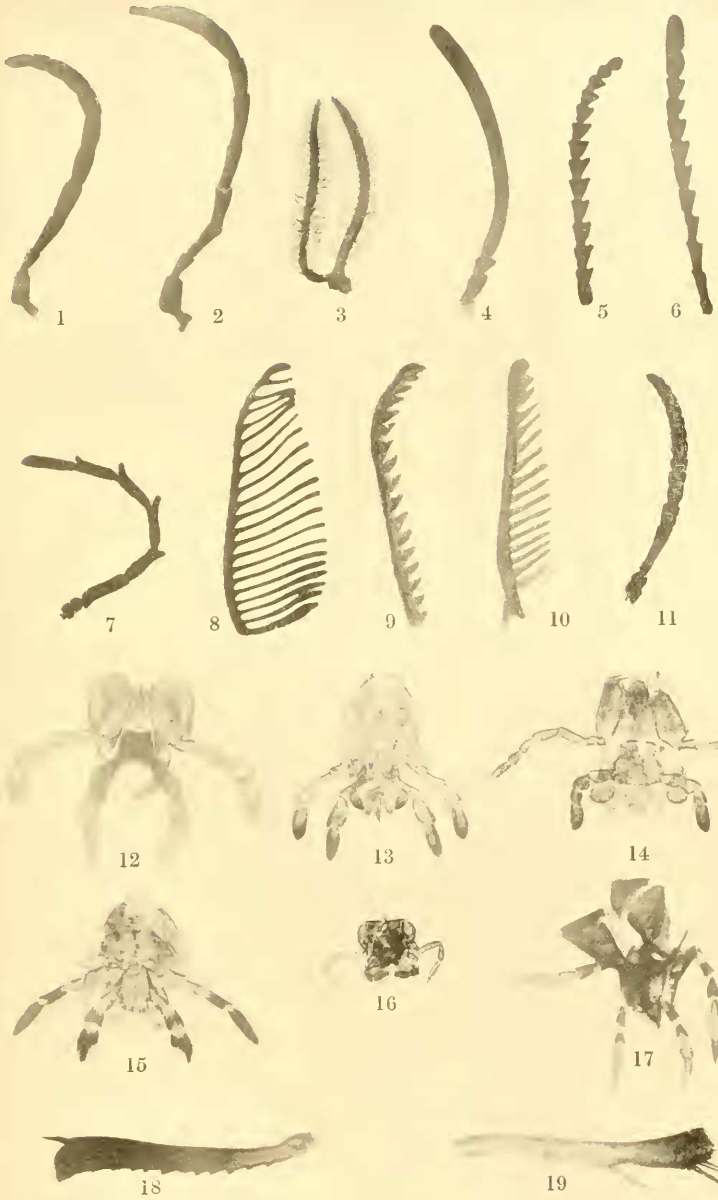
AUSTRALIAN SAWFLIES.

Explanation of Plate XI.

Fig. 1. Wings of *Ophrynopus sericatus*, ♀.
2. ,, ,, ,, ♂.
3. ,, *Zenarge turneri*.
4. Hind-wing of *Antargidium apicale*.
5. Hair-patch (*androconia*?) on fore-wing of *Perga polita*, ♂, slightly magnified.
5*a*. Hairs from same, magnified ($\frac{1}{2}$ in. power).
5*b*. One of the hairs more highly magnified ($\frac{1}{6}$ in. power).
6. Wings of *Phylacteophaga eucalypti*.
7. *Perga castanea*, ♂, showing hair-patches on both wings of each pair.
8. Wings of *Diphamorphos minor*.
9. ,, *Neoeurys* sp. (?).
10. ,, *Eurys laetus*.
11. ,, *Clarissa divergens*.
12. ,, *Pterygophorus uniformis*.
13. ,, *Philomastix nancarrowi*.

Explanation of Plate XII.

Fig. 1. Antenna of *Ophrynopus sericatus*, ♂.
2. ,, ,, ,, ♀.
3. ,, *Trichorhachus nitidus*, ♂.
4. ,, *Zenarge turneri*, ♂.
5. ,, *Philomastix nancarrowi*, ♂.
6. ,, ,, ,, ♀.
7. ,, *Phylacteophaga eucalypti*, ♂.
8. ,, *Pterygophorus uniformis*, ♂.
9. ,, ,, ,, ♀.
10. ,, ,, *analis*, ♀ (!).
11. ,, *Diphamorphos minor*, ♀.
12. Mouth-parts (palpi, etc.) of *Perga dorsalis*.
13. ,, ,, ,, *ferruginea*.
14. ,, ,, *Xyloperga univittata*.
15. ,, ,, *Philomastix nancarrowi*.
16. ,, ,, *Phylacteophaga eucalypti*.
17. ,, ,, *Pterygophorus uniformis*.
18. Hind tibia of *Ophrynopus sericatus*, ♀.
19. Middle ,, *Zenarge turneri*, ♀.



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